

# Bothalia

A RECORD OF  
CONTRIBUTIONS  
FROM THE  
NATIONAL HERBARIUM  
UNION OF SOUTH AFRICA  
PRETORIA



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# DESCRIPTIONS OF THE SOUTH AFRICAN PYTHIACEAE WITH RECORDS OF THEIR OCCURRENCE.

By Vincent A. Wager.

## INTRODUCTION.

The fungi belonging to the Pythiaceae had received little attention from plant pathologists in South Africa before the writer (25) became interested in this group. Until then, only three species had been recorded, namely, *Phytophthora infestans* on potatoes (late blight), *Ph. parasitica* on rhubarb (crown rot), and *Ph. citrophthora* on citrus (brown rot). During the writer's investigation of root-rot diseases of vegetable and garden plants, Pythiaceae species were encountered more and more frequently, showing that this group of fungi is fairly common, and widely distributed in South Africa. They have been isolated on more than one hundred occasions from forty-four different host plants. They have been isolated from roots and stems of wilting plants, from bark or trunk lesions, from rotting fruits and from many dying and rotting succulent plants. More often than not they were associated with other wilt-producing fungi, more especially species of *Fusarium*, *Rhizoctonia solani*, or *Sclerotium rolfsii*. In large numbers of instances, these latter fungi were probably responsible for the disease in the affected plants, the Pythiaceae being secondary, or living saprophytically in the decaying tissues. Some of them, however, are solely responsible for serious diseases, for instance, *Pythium ultimum* or *P. aphanidermatum* for the foot-rot of papaws (26), and the latter fungus for "leak" disease of potatoes (27). That these fungi have a wide distribution may be shown by the fact that in 1925 the first record of *Ph. citrophthora* was made by Doidge (10) when the fungus appeared in epidemic form causing a brown-rot of oranges in most areas where oranges were grown. Also in 1934 *Ph. parasitica* was recorded by the writer (29) for the first time as a serious disease of tomato fruits, when the trouble occurred in epidemic form over a large area in the eastern Transvaal.

All the Pythiaceae fungi collected have been allotted to 10 known species of *Pythium* and seven known species of *Phytophthora*.\* In some cases there are slight differences between these fungi and the original descriptions, but such differences have not been considered sufficiently great to justify making new species.

In the following pages all the fungi mentioned were isolated by the writer unless where otherwise stated, and when localities are not mentioned, they should be understood as meaning the Transvaal.

The writer wishes to thank Mr. S. F. Ashby and his staff at the Imperial Mycological Institute, and Dr. C. M. Tucker of the University of Missouri, for their kind assistance in determining the identity of these organisms. He was also fortunate in meeting Dr. J. T. Middleton at the University of California who is monographing the genus *Pythium*, and is greatly indebted to him for examining the cultures and confirming their identity, and for reading the manuscript. As Dr. Middleton is also including all known records of the host plants and distribution of the species of *Pythium* in his monograph, information on this point is not included in this paper.

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For the sake of convenience the words *Pythium* and *Phytophthora* have, in this paper, been abbreviated to *P.* and *Ph.* respectively.

\* All the cultures have been lodged in the American Type Culture Collection, Washington, D.C.

**Pythium ultimum** Trow.

*Hyphae* are from 3 to 9  $\mu$  in diameter, much branched, and septate in old cultures.

*Oogonia* are smooth, terminal or rarely intercalar, spherical, or slightly irregular in shape. The diameter ranges from 13.5 to 29.3  $\mu$ , the average diameter from different strains being from 18.9 to 23.2  $\mu$ .

*Oospores* are spherical with a smooth, thick wall. The diameter ranges from 11.3 to 23.4  $\mu$ , the average diameter from different strains being from 16.0 to 18.9  $\mu$ . They germinate after a period of rest, producing one or more germ tubes.

*Antheridia* are generally one to each oogonium, rarely two; the antheridium has a very short, or practically no stalk; it arises immediately below the oogonium, very rarely from a neighbouring hypha; is more or less horn-shaped, and curves around sharply so that its tip is applied to the oogonium.

*Sporangia* are mainly terminal and spherical, sometimes intercalar and lemon-shaped; they vary in diameter from 12 to 31  $\mu$ , the average diameter in different strains being from 20.6 to 24.2  $\mu$ ; they germinate by the production of from one to three germ tubes.

Strains of this fungus isolated from various hosts may differ to a slight extent from one another. In culture media, some produce more aerial mycelium than others; some produce sporangia sparsely and oogonia in abundance, while in others the opposite is the case. There is also some variation in the average size of the oospores, oogonia, and sporangia in the different strains. In all, however, the antheridium is typical and characteristic. The fungus grows well on prune and oatmeal agars. The optimum temperature for the growth varies from 25 to 30°C. in most of the strains, but 35°C. for a few. The maximum temperature is above 37°C. and the minimum is from 4 to 7°C.

The fungus differs very little from that originally described by Trow (22). His average measurements for the oogonia and oospores are 20.6 and 16.3  $\mu$  in diameter respectively. A distinctive character of the fungus is the fact that the production of zoospores has never been observed. One difference is that Trow states his fungus to be saprophytic, while here it is parasitic and responsible for numerous diseases.

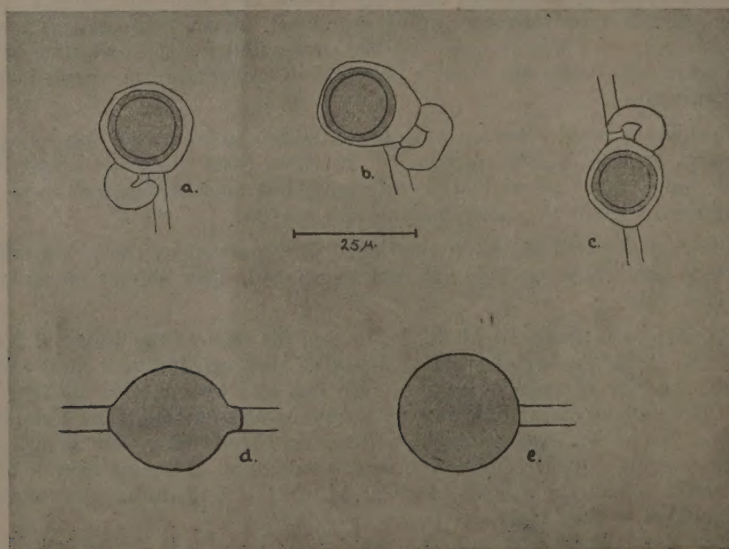


FIG. 1.—*P. ultimum*. (a) and (b) Terminal, and (c) intercalar oogonia and antheridia, (d) intercalar and (e) terminal sporangia.



A culture labelled *P. debaryanum* Hesse was obtained from the Centraalbureau, Holland, and grown in parallel series with a typical culture of *P. ultimum*. The two fungi were found to be similar in all respects, both having the same type of antheridium, and neither producing zoospores when grown in suitable water cultures, including insects. This fungus from Holland was undoubtedly a typical culture of *P. ultimum* and it is quite likely that this same mistake in identity has been made before by other writers. Drechsler (11) also drew attention to this fact and mentioned the difference between the two species.

#### HOSTS.

*P. ultimum* appears to be the commonest species of the *Pythiaceae* encountered in South Africa and has been isolated from a large number of plants. It may cause a disease of papaws known as "foot-rot", where the base of the trunk becomes soft and rotten, and the plant collapses (26). It has been isolated from this host on 11 occasions from the eastern, northern and western Transvaal, from Natal and the Cape.

It has also been isolated from the following plants, often along with *Rhizoctonia solani* Kuhn, or species of *Fusaria*, and all from the Transvaal except where otherwise stated:

From wilted bean, peanut, tomato, pea (six occasions), tobacco collar-rot and wilt (E. S. Moore), sweet potato infected with soft-rot, rhubarb infected with crown-rot and associated with *Ph. parasitica* from Balfour, Cape, from cabbage infected with soft heart-rot from Port Elizabeth, Cape, and from the navel-end of young Washington navel oranges. From wilted asters (twice), delphiniums (twice), gillias from Natal, nasturtium, pink, sweet peas (four times), witchweed (*Striga lutea*), Iceland poppies (twice) and from damped-off seedlings of Iceland poppy, dahlia, and pine trees.

From the following succulents all infected with a soft-rot, *Dinteranthus microspermus*, *Fenesturia aurantiaco*, *Duvalia parvifolia*, *Delosperma* sp., *Stapelia* sp. *Tavaresia* sp., *Aloe variegata* and *Mesembryanthemum* sp.

Hopkins (15) from Rhodesia reports *P. ultimum* on damping-off seedlings of *Clarkia elegans*, *Cupressus* sp., *Coleus* sp., *Pinus* sp., *Carica papaya*, and *Nicotiana tabacum*.

In inoculation experiments *P. ultimum* has been found capable of producing a foot-rot of papaws, soft-rots of potatoes, sweet-potatoes and oranges, and also a rapid wilting of asters when the plants were inoculated through wounds. It caused only the slow wilting and death of a small percentage of Iceland poppies inoculated with it. It is probable that in some cases the fungus is only a weak parasite, but may hasten the wilting when associated with more virulent pathogens, or if the host is weakened through some cultural fault. An interesting case of the longevity of the fungus in the soil was observed. In an experiment, papaws were inoculated with *P. ultimum*, and one plant partially wilted but recovered. It continued growing in the tin in the greenhouse for eight years. At the end of one year a few particles of the soil were removed from the tin and plated, and cultures of *P. ultimum* were obtained. This was repeated after the fifth year, and again after the eighth year, and in each case the fungus was recovered, showing that it was capable of living in the soil without being in the tissue of a plant during this period of time.

#### ***Pythium aphanidermatum* (Eds.) Fitz.**

*Hyphae* are much branched and non-septate except in fructifications; vary in diameter from 2 to 10  $\mu$ , commonly about 6  $\mu$ .

*Oogonia* are smooth, spherical and terminal, sometimes intercalary; range in diameter from 18 to 31.5  $\mu$  with an average of 25.3  $\mu$ .

*Oospores* are spherical with smooth, thick walls, and do not fill the oogonia; range in size from 15.8 to 22.5  $\mu$  with an average of 21.3  $\mu$  in diameter.

*Antheridia* are sub-orbicular and broadly clavate, being closely appressed to the oogonium; generally one to each oogonium, sometimes two; may arise from the oogonial hypha, more usually from another; may be terminal or intercalary and about 11  $\mu$  in size.

*Sporangia*.—A terminal hypha becomes swollen and usually produces lobulate outgrowths; a septum is formed cutting off this portion which may be up to  $150\mu$  in length, from the rest of the hypha. Usually from the tip, more rarely from one of the lobulate outgrowths, the vesicle is produced, and may be up to  $50\mu$  or more in diameter. From 8 to 40 zoospores are produced in the vesicle depending on its size. The zoospores are  $9 \times 12\mu$  in average size, and are bi-ciliate.

The fungus grows well on prune and oatmeal agars forming profuse white, cottony, aerial mycelium. The optimum temperature for growth is approximately  $34^{\circ}\text{C}$ ., maximum is above  $37^{\circ}\text{C}$ . and no growth takes place at  $7^{\circ}\text{C}$ . The average size, both of the oogonia and oospores, varies only slightly in different cultures from different hosts. The zoospores have been noticed to conjugate, usually in pairs, but as many as 11 have become fused to form a spherical body, which subsequently germinated in a similar manner to a single zoospore. This occurrence does not appear to have been observed by other writers.

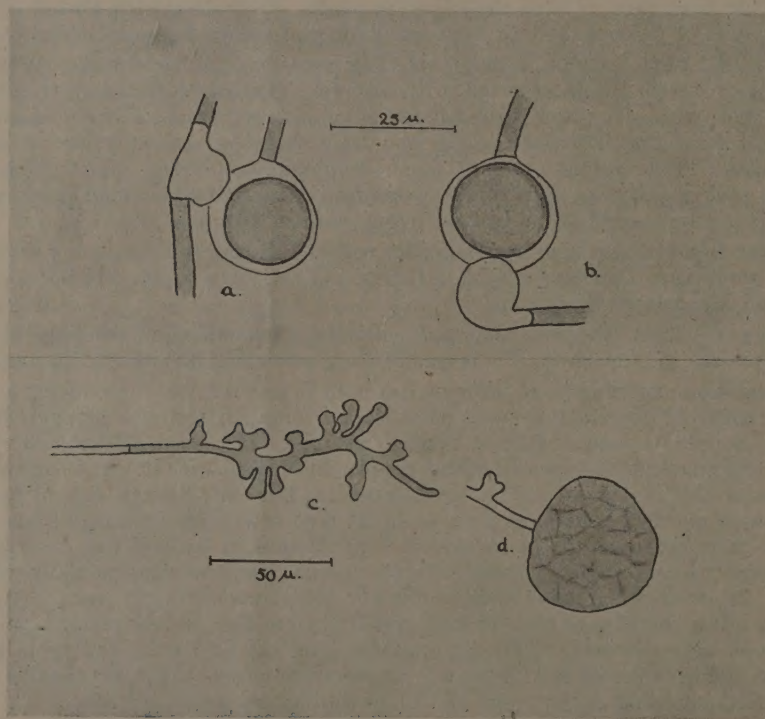


FIG. 2.—*P. aphanidermatum*. (a) Intercalar and (b) terminal antheridium and oogonium, (c) lobulate sporangium, and (d) the vesicle and developing zoospores produced at the tip of (c).

#### Hosts.

*P. aphanidermatum* is responsible for a serious disease of potatoes known as "Soft-rot" or "Leak", which was described in a previous paper (27). It was also found on two occasions to cause a foot-rot disease of papaws in the same manner as does *P. ultimum*. It was isolated from rotting tomato fruits from the northern Transvaal, and from the stems of wilted tomatoes sent from Windhoek, S.W. Africa, and also from wilted squash (*Cucurbita pepo*) from the same locality. It was isolated from the rotting fruits of the chou-chou (*Sechium edule*) and brinjal or egg-plant (twice). It was obtained from damping-off tobacco



seedlings from Balfour, Cape, and from a wilted tobacco plant from the western Transvaal (E. S. Moore). It was isolated from a wilting bracken plant (*Pteridium aquilinum*) and also caused serious destruction in young transplanted tomatoes by rotting away the stems (28).

Hopkins (15) reports it on *Nicotiana tabacum* in Rhodesia.

***Pythium irregulare* Buisman.**

*Hyphae* are commonly  $4.5\ \mu$  in diameter, seldom more but may be less ; much branched, and non-septate except in older cultures.

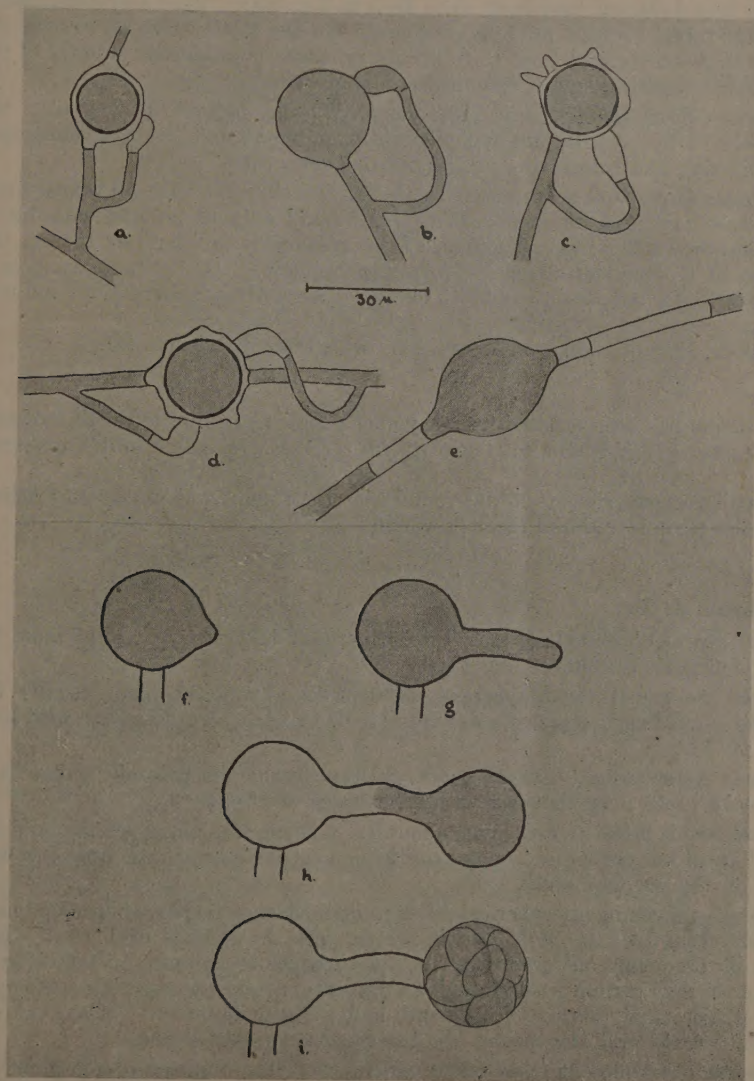


FIG. 3 — *P. irregulare*. (a), (b), (c) and (d) Antheridia and oogonia, (e) an intercalary sporangium, (f), (g), (h) and (i) a terminal sporangium showing stages in the production of zoospores.

*Oogonia* are mostly intercalar, but sometimes terminal on short lateral branches; may be spherical or irregularly lobed or sometimes with definite narrow processes; vary somewhat in size, but are commonly  $22\ \mu$  in diameter.

*Oospores* are spherical with a smooth, thick wall, not filling the oogonium,  $13$  to  $20\ \mu$  in diameter.

*Antheridia* are club-shaped to cylindrical, straight or curved; usually one, sometimes two and rarely three to an oogonium; the antheridial stalk is fairly long and usually arises from the same hypha that bears the oogonium.

*Sporangia* may be terminal or intercalar, more often the latter; they are spherical, or lemon- or barrel-shaped, and from  $13$  to  $28\ \mu$  in diameter. They may germinate by one or more germ tubes, or may produce zoospores. In the latter case, an evacuation tube about  $4.5\ \mu$  in diameter, and from  $15$  to  $22.5\ \mu$  in length is produced; the tip of the tube swells out into a vesicle which is spherical and thin-walled.

*Zoospores*.—From three to nine zoospores have been observed in a vesicle; they are approximately  $13.5 \times 9\ \mu$  in size and vigorously motile at first, later becoming spherical, about  $10\ \mu$  in size, and germinate, sending out one germ tube.

The fungus grows well on prune and oatmeal agar, and conidia and sexual organs are readily produced in large numbers. The fungus could only be induced with difficulty to form its zoospores. This was accomplished by growing it on sterilised locusts in water incubated at  $27^\circ\text{C}$ ., frequent changes of water being made. The optimum temperature for growth was  $22^\circ\text{C}$ . for one strain and  $28^\circ\text{C}$ . for the other, with maximum  $37^\circ\text{C}$ . and minimum  $4^\circ\text{C}$ .

The above description agrees fairly closely with that of Buisman (6).

#### HOSTS.

*P. irregulare* has been isolated from a young papaw plant infected with foot-rot in the northern Transvaal, and from a rotting citrus fruit (E. M. Doidge) from the western Transvaal.

In inoculation experiments it was found that the fungus was unable to produce a rot of citrus fruits when introduced through wounds.

#### *Pythium vexans* de Bary.

*Hyphae* are much branched, most of the branches being very fine, the main branches commonly  $4.5\ \mu$  in diameter.

*Oogonia* are smooth and spherical, often with a widened base, usually terminal, occasionally intercalary; range in size from  $15.8$  to  $22.5\ \mu$  in diameter, with an average (of 50) of  $19.4\ \mu$ .

*Oospores* are spherical, with a smooth, thick wall which is generally yellow in colour; range from  $13$  to  $18\ \mu$  in diameter with an average of  $16.2\ \mu$ .

*Antheridium* is broad and clasping, about  $5\ \mu$  in thickness, and covering about one-third of the surface of the oogonium; may arise from a separate hypha, or from just below the oogonium on the oogonial stalk.

*Sporangia* are commonly spherical and terminal, but may be pear-shaped and intercalary; vary in size from  $13.5$  to  $22.5\ \mu$  in diameter, with an average of  $17.3\ \mu$ . They may germinate by producing one germ tube, or may produce zoospores. In the latter case the contents of the sporangium pass through an evacuation tube into a vesicle; the evacuation tube is most commonly about  $7\ \mu$  in length and  $4.5\ \mu$  in diameter. When the zoospores emerge, the vesicle wall disappears, but the evacuation tube persists.

*Zoospores*. In different cases under examination, the numbers of zoospores produced were 11, 7, 10, 11, 10. They are elongate and about  $11.5 \times 9\ \mu$  in size; they round off to about  $9\ \mu$  in diameter, and germinate by one germ tube.



The appearance of the culture on Petri dishes poured with agar is distinctive, the fungus making a fine radial growth, and, as Braun (4) suggests in his description of *P. complectens*, having the appearance of combed silk. Sporangia are produced abundantly on most media, but oogonia are at first very scarce. They may be obtained fairly readily in the aerial fluffy mycelium of a culture on oatmeal agar three to four weeks old. Zoospores were obtained in large numbers when portions of a three-week culture on oatmeal agar were transferred to watchglasses containing Petri's solution, or dilute bean broth, and left in the dark for 15 to 20 minutes. The whole process of zoospore formation is extremely rapid; in one case only 14 minutes elapsed from the moment the vesicle was produced until the zoospores escaped. The temperatures for growth are optimum 28 to 31°C., maximum 37 and minimum 13°C.

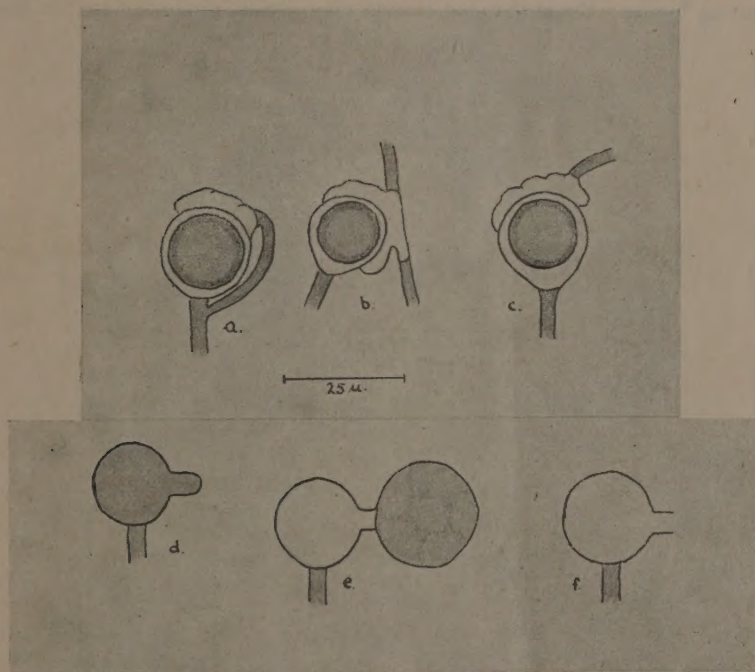


FIG. 4.—*P. vexans*. (a), (b) and (c) Antheridium and oogonium, (d) sporangium and evacuation tube, (e) formation of vesicle, and (f) after the escape of the zoospores.

The above description of the fungus agrees very closely with that of *P. complectens* and *P. vexans*. The sporangia, however, are somewhat smaller, the average diameter being about 4  $\mu$  less than those described for both these species. Middleton (17) suggests dropping the name *P. complectens* in favour of the earlier *P. vexans*, stating that in his opinion the differences between the two species are not sufficiently great to justify the retention of the two species.

#### HOSTS.

*P. vexans* has been isolated from two different plants; in the first instance, along with *P. aphanidermatum* from a papaw infected with foot-rot, and secondly, along with species of *Fusarium*, from a perennial statice plant infected with wilt or crown-rot.

***Pythium myriotylum* Drechsler.**

*Hyphae* are much branched, the main branches being up to  $9\ \mu$  in diameter; the side branches are variable in thickness, sometimes being thin, 2 to  $3\ \mu$ , or are swollen out into clavate, lobulate-like processes often in groups and usually in contact with the glass of the culture vessel—the appressoria.

*Oogonia* are smooth and spherical, usually terminal on short thin branches but may be intercalary; range in size from  $22.5$  to  $28.9\ \mu$ , with an average of  $25.5\ \mu$  in diameter.

*Oospores* are smooth and spherical with a thick wall; occasionally two in one oogonium; range in size from  $13.5$  to  $22.5\ \mu$  with an average of  $18.5\ \mu$  in diameter.

*Antheridia* commonly three to six to each oogonium, but may be more; appear like undifferentiated hyphae about  $4.5\ \mu$  in thickness; may clasp the oogonium closely or only at the tip; the hypha bearing the antheridium may arise from the oogonial branch, or from a neighbouring hypha; the antheridial branch may divide, producing two or more antheridia.

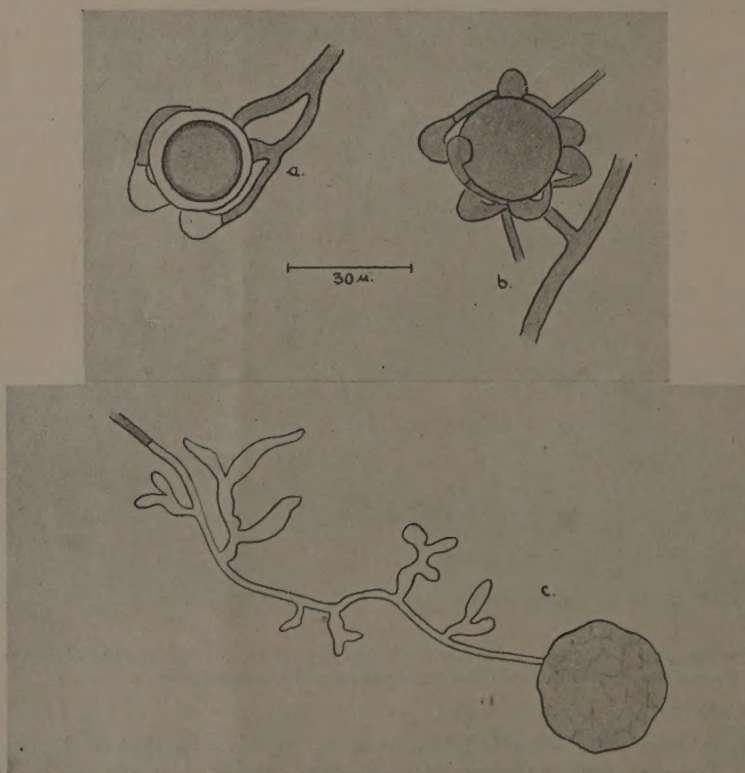


FIG. 5.—*P. myriotylum*. (a) and (b) Oogonia and antheridia, (c) a lobulate sporangium and vesicle.

*Sporangia* are irregular in shape, usually being formed of the end portion of a hypha with lobulate and rounded outgrowths, very variable in shape and size; the vesicle is produced from one of the lobulate outgrowths, or from the tip of the hypha, and is up to  $40\ \mu$  in diameter, depending on the size of the sporangium; up to 40 zoospores are produced in the vesicle.

*Zoospores* are vigorously motile, 9 to  $11\ \mu$  in size before they round off and germinate.



The fungus grows well on various agars, forming abundant aerial mycelium. Oogonia are readily produced on oatmeal agar after three weeks, and sporangia are produced when portions of a culture on plain water agar are placed in Petri's solution and left in the dark for a number of hours. The above description agrees closely with that of Drechsler (12).

The temperatures for growth are optimum 34, maximum about 37, and minimum 7°C.

#### Hosts.

*P. myriotylum* has been isolated only once, and that, along with *P. aphanidermatum* and *P. verans* from papaw plants infected with "foot-rot".

#### *Pythium splendens* Braun.

*Hyphae* are very much branched, the main branches being commonly 6  $\mu$  in diameter, but may be as much as 9  $\mu$ ; sickle-shaped bodies or appressoria, often in chains, may develop on the medium in contact with the glass.

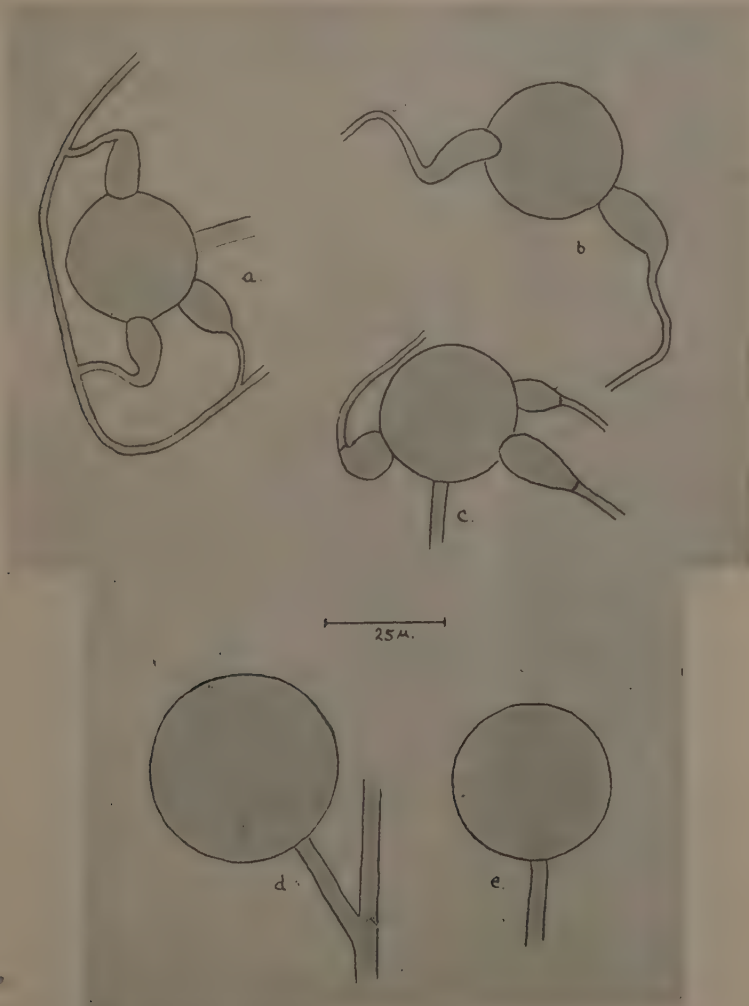


FIG. 6.—*P. splendens*. (a), (b) and (c) Antheridia and oogonia, (d) and (e) sporangia.

*Oogonia* are smooth, spherical, and terminal; from  $27.2$  to  $35\ \mu$ , commonly  $33\ \mu$  in diameter.

*Oospores* were not seen by the writer, the contents of the oogonium remaining undifferentiated.

*Antheridia* one to three to each oogonium, clavate,  $8$  to  $15\ \mu$ , usually  $10\ \mu$  long by  $5$  to  $6\ \mu$  wide, the blunt end being applied to the oogonial wall; produced on a hypha adjacent to that producing the oogonium.

*Sporangia* spherical, smooth, thin-walled, and terminal; vary from  $19.8$  to  $49.5$ , commonly  $33\ \mu$  in diameter. Germinate readily producing one or more germ tubes.

The fungus forms profuse aerial mycelium on most culture media. Sporangia are produced after two days and appear in very large numbers. It was some years before the writer was able to obtain any oogonia. They were finally discovered on a potato dextrose culture some three months old, and about a dozen were seen. The contents of the oogonium remained undifferentiated, and oospores were not produced. Braun (5) had a similar difficulty in obtaining oogonia; his figures are, oogonia  $25.5$  to  $34.7$ , average  $31.7\ \mu$  in diameter, and oospores, spherical, with thick walls,  $21.3$  to  $29.8$ , average  $26.6\ \mu$ ; antheridia were three to eight to each oogonium, and he also stated that the fungus does not produce zoospores. The S. African fungus thus agrees fairly closely with the description by Braun except in the matter of the number of antheridia produced.

Temperatures for growth are optimum  $31$ , maximum  $37$  and minimum  $7^{\circ}\text{C}$ .

This fungus was mentioned in a previous publication Wager (25) under the name of *P. cf. splendens*.

#### HOSTS.

*P. splendens* was isolated only once, and that, along with *P. ultimum*, from a papaw tree infected with "foot-rot" from the eastern Transvaal.

#### *Pythium spinosum* Sawada.

*Hyphae* may range from  $2$  to  $8\ \mu$  in diameter, much branched, and septate in old cultures.

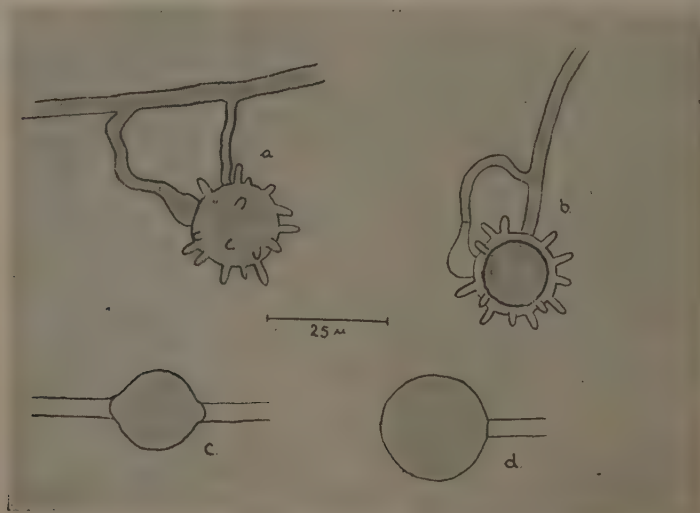


FIG. 7.—*P. spinosum*. (a) and (b) Antheridium and oogonium, (c) intercalary and (d) terminal sporangium.



*Oogonia* are spherical and covered with spines ; they are commonly produced terminally on short lateral branches, but may be intercalary ; range from 13.5 to 23.4  $\mu$  in diameter, with an average (of 50) of 17.2  $\mu$ .

*Spines* are blunt, narrow, finger-like processes ; they are about 4 to 8  $\mu$  long by 1.5  $\mu$  wide ; from 10 to 21 spines being visible laterally on the oogonium.

*Oospores* are spherical and smooth, and practically fill the oogonial cavity.

*Antheridia* are usually one to each oogonium, sometimes two or even three ; each is borne on a fairly long, slender branch from the same hypha that produced the oogonial branch, or from a neighbouring hypha ; it is cut off by a septum from the antheridial branch, and is sub-cylindrical or club-shaped.

*Sporangia* are produced abundantly in water cultures ; they may be terminal and spherical, or intercalary and lemon-shaped or cylindrical ; they are smooth but occasionally may have a few spines ; they vary greatly in size from 9 to 27  $\mu$  in diameter, and germinate, producing one to three germ tubes.

Temperatures for growth are optimum 25 to 28, maximum 37 and minimum 4°C.

This fungus differs from Sawada's description (19, 20) in the fact that multiple antheridia are common whereas he described only single. In correspondence with the writer, E. J. Butler stated that he had examined a culture of *P. spinosum* from the Centraal-bureau, Holland, and found that it also had multiple antheridia, a fact that Sawada had evidently overlooked. In the original description the oogonia are given as ranging from 17 to 24  $\mu$  in diameter, with 19.7  $\mu$  the average, being thus somewhat larger than those described above. According to the original description this fungus does not produce zoospores, and none has been observed.

#### Hosts.

*P. spinosum* has been isolated only once from a young papaw plant infected with foot-rot. The plant had been sent in from a plantation which had just been badly frosted, and as a result nearly all the plants died ; the fungus was thus probably not responsible. *P. irregulare* was isolated from an adjacent plant.

#### *Pythium acanthicum* Drechsler.

*Hyphae* are generally very slender, wavy and branched. The mycelium develops successive ridges or scalloped frills as the culture in a tube of oatmeal agar gets old, in a very characteristic manner.

*Oogonia* are spherical and covered with spines ; terminal on short slender branches, occasionally intercalary ; vary in size from 18 to 27  $\mu$  with an average of 22.3  $\mu$  in diameter, exclusive of spines.

*Spines* are conical with blunt points, slightly longer than broad at the base, and about 2  $\mu$  in length.

*Oospores* are smooth and spherical, nearly filling the oogonium, and thin-walled ; vary from 15.8 to 22.5 with an average of 19  $\mu$  in diameter ; may germinate, producing one or numerous germ tubes, or may develop immediately into a sporangium.

*Antheridia* are commonly one to each oogonium, sometimes two, rarely three ; sub-spherical or clavate, 7 to 10  $\mu$  in size, making a broad contact at the tip with the oogonial wall ; borne on a short branch usually arising from the same hypha as the oogonium, or from a neighbouring hypha.

*Sporangia* are smooth, thin-walled, spherical, ovoid, or irregular in shape; terminal or intercalary; range in diameter up to  $31.5$ , but commonly  $22\mu$ ; germinate with the production of numerous, slender germ tubes, or may produce an evacuation tube  $30$  to  $85\mu$  in length, and from  $2.5$  to  $4\mu$  in diameter; the vesicle is produced at the end of the evacuation tube, is spherical and its contents are rapidly divided up into zoospores.

*Zoospores.* From  $8$  to  $30$  zoospores have been observed in a vesicle; they are about  $11 \times 7\mu$  in size and vigorously motile at first.

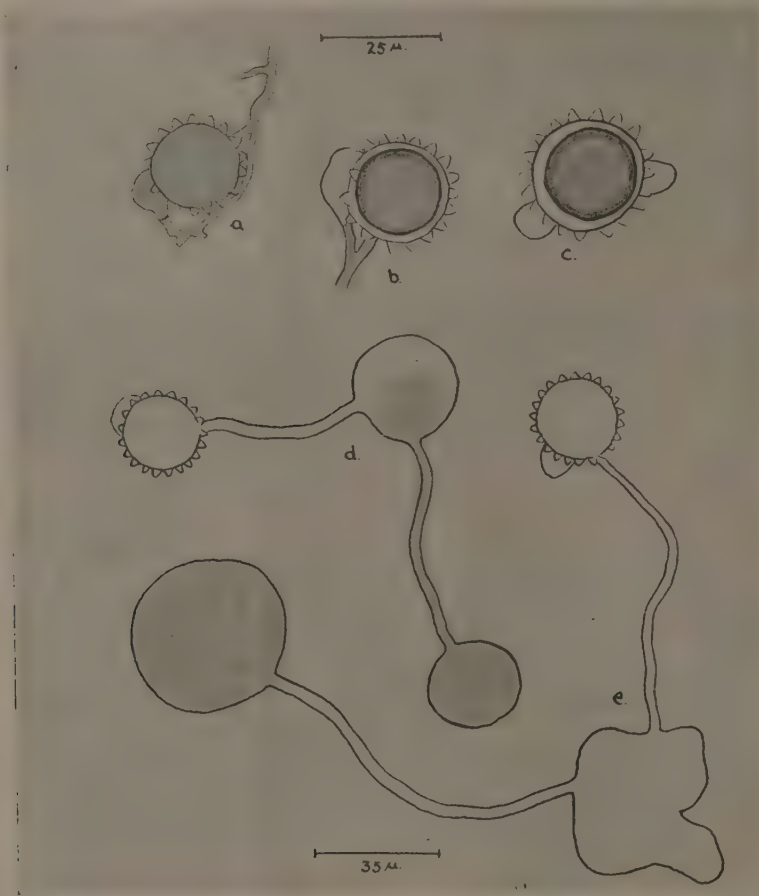


FIG. 8.—*P. acanthicum*. (a), (b) and (c) Antheridia and oogonia, (d) and (e) sporangium, evacuation tube, and vesicle produced directly from the oospore.

The fungus grows well on prune or oatmeal agars. Oogonia are produced readily but sporangia are scarce. They were formed when portions of a Petri-dish culture eight weeks old were transferred to Petri's solution. In liquid cultures it was noticed that oospores often germinated, producing a single tube from  $10$  to  $90\mu$  in length, the tip of which swelled out to form a sporangium. This sporangium might be up to twice the size of the oospore, and spherical, ovoid or irregular in shape; it produced an evacuation tube and vesicle in the manner described above. Drechsler (12) mentions this fact in his description of this fungus.

Temperatures for growth are optimum 25, maximum 37, and minimum 10°C.

#### Hosts.

*P. acanthicum* has been isolated twice ; from wilted peas, and from damping-off dahlia seedlings. In each case *P. ultimum* was isolated at the same time.

#### *Pythium oligandrum* Drechsler.

*Hyphae* are generally slender, but up to 7  $\mu$  in diameter, much branched ; the fungus produces little aerial mycelium on culture media.

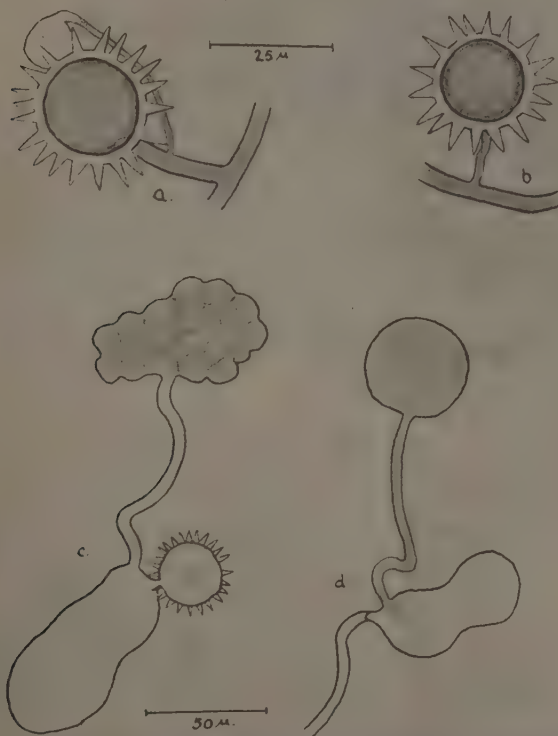


FIG. 9.—*P. oligandrum*. (a) Oogonium and antheridium, (b) parthenogenetic oogonium, (c) sporangium and vesicle produced directly from oospore, and (d) ditto produced in ordinary manner on a hypha.

*Oogonia* are spherical and covered with spines ; terminal on short slender branches, rarely intercalary ; size exclusive of spines varies from 18 to 27.4  $\mu$  in diameter, with an average of 23.4  $\mu$ , on oatmeal agar.

*Spines* are sharp-pointed, conical, about twice as long as broad at the base, vary from 3.4 to 7.7  $\mu$ , commonly 5.0  $\mu$  in length.



*Oospores* are smooth, spherical, and thin-walled; range from  $15.8$  to  $22.5\ \mu$  in diameter, with an average of  $20.5\ \mu$  on oatmeal agar; germinate readily, producing either numerous slender germ tubes or sporangia.

*Antheridia* are rare; when present are closely pressed to the oogonium; are semi-circular or clavate, about  $9\ \mu$  wide, borne on a slender branch which arises from the same branch as the oogonium, or a neighbouring one, the branch twining around the oogonium; usually one, very seldom two to one oogonium; most oospores appear to develop parthenogenetically.

*Sporangia* are readily produced on plain water agar; large, ellipsoid, spherical, elongate or irregular in shape, sometimes with lobulate processes; usually terminal, but may be intercalary; range in size up to  $90\ \mu$  in length, but commonly about  $50\ \mu$ ; may germinate producing numerous germ tubes, or may form zoospores, in which case the evacuation tube is usually  $4.5\ \mu$  thick, wavy, and from  $36$  to  $72\ \mu$  long; the vesicle is spherical at first, later irregular in shape, and from  $27\ \mu$  in diameter to  $67.5$  by  $36\ \mu$ ; the number of zoospores produced in four cases observed were 5, 5, 6, and 19.

*Zoospores* vary in size from  $12$  to  $14 \times 9\ \mu$ , vigorously motile at first, later become spherical and germinate.

The four cultures obtained behave in the same manner and differ only slightly from each other in their measurements. In two of them, however, antheridia have not been observed, and are rare in the other two; the oospores appear to develop parthenogenetically. On oatmeal agar, oogonia are produced in profusion, but very few sporangia. On plain water agar, both oogonia and sporangia are numerous. Zoospores are not readily obtained; they were observed in one case where a portion of a culture on plain agar was placed in Petri's solution for four days, and then transferred to tap water for a few hours. Sometimes the contents of a sporangium pass along the evacuation tube into a vesicle, and no further change takes place. This vesicle may later act as a secondary sporangium and produce another evacuation tube and vesicle in a normal manner.

Temperatures for growth are optimum  $25$  in one strain and  $31$  in another, maximum  $37$  and minimum  $10^\circ\text{C}$ .

It was also observed that when placed in water culture, the oogonia germinate and their contents develop immediately into a sporangium which in turn gives rise to an evacuation tube and vesicle as shown in figure 9. This phenomenon is not mentioned by Drechsler (12). The above description of this fungus agrees fairly well with that of Drechsler except that his oogonia are some  $3\ \mu$  larger in average diameter.

#### Hosts.

*P. oligandrum* has been isolated from shirley poppy, antirrhinum, marrow and cabbage plants, all suffering from wilt. In a previous paper (Wager, 25) this fungus was mentioned under the name of *Pythium* sp. cf. *artotrogus*, as isolated from the first two host plants mentioned above. In inoculation experiments with iceland poppies and asters, the fungus was unable to produce any wilt symptoms. It is probably a weak parasite attacking plants weakened through faulty cultural practices, or plants already wilting due to the attack of some other more virulent pathogen.

#### *Pythium debaryanum* Hesse (= *P. fabae* Cheney).

*Hyphae* are usually slender, up to  $6\ \mu$  thick, commonly  $3\ \mu$ , much branched.

*Oogonia* are commonly intercalary and sub-globose to lemon-shaped, or terminal and spherical, variable in size from  $12$  to  $25\ \mu$ , commonly  $16\ \mu$  in diameter.

*Oospores* are spherical, thick-walled, and practically fill the oogonia.

*Antheridia* are tubular, making contact at narrowed tip of enlarged apical portion; fairly long antheridial branch which is usually curved or crook-necked; one to three to each oogonium, frequently two, especially on intercalar oogonium when one arises from each side of it; the antheridial branch may arise near the base of the oogonium or some way back along the oogonial branch, or occasionally from a separate hypha.

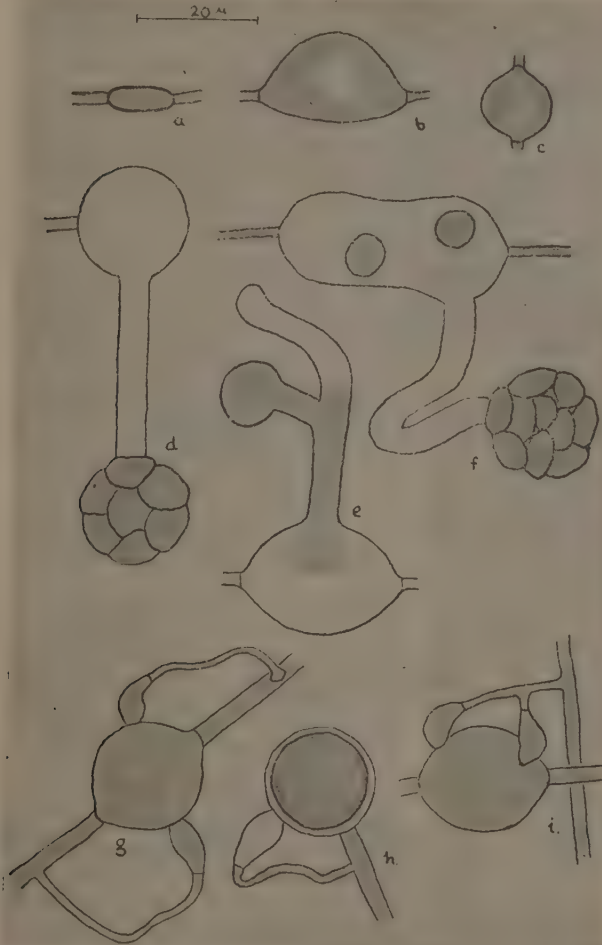


FIG. 10.—*P. debaryanum* (= *P. fabae*.) (a), (b) and (c) Variable-shaped intercalar sporangia, (d) terminal sporangium, evacuation tube, vesicle, and developing zoospores, (e) sporangium, old evacuation tube and new evacuation tube and developing vesicle, (f) sporangium and vesicle and zoospores produced in sporangium, (g), (h) and (i) oogonia and antheridia.

*Sporangia* may be terminal and spherical and from 10 to 30, commonly  $21.5 \mu$  in size; they are more generally intercalar and irregular in shape, from barrel-shaped, ovoid, elongate or sausage-shaped, and may be very small—like fragments of a hypha—or up to  $60 \times 20$ , commonly about  $20 \mu$  in size; all have a large and pronounced vacuole within. They germinate rarely, usually with the production of one germ tube. Zoospores may be



produced in liquid cultures; the evacuation tube is produced laterally, is thick, and is one to three times the length of the sporangium, commonly  $30\ \mu$  long, and is quite commonly curved or bent; an evacuation tube may be produced but not used, and later another one may be formed or the old one may produce a branch; the contents of the sporangium pass very rapidly into the forming vesicle; sometimes not all the contents of the sporangium pass into the vesicle and thus a few spores may develop within the sporangium as well as in the vesicle; zoospores are 7 to  $8\ \mu$  in size, and 12 and 14 were seen produced in various vesicles.

Sporangia are produced in abundance on all media, but oogonia are very scarce, only a few being seen on an old culture. Temperatures for growth are optimum 22, maximum 28, minimum  $7^{\circ}\text{C}$ .

In correspondence with the writer, S. F. Ashby suggested that this fungus might possibly be *P. fabae*. Cheney's (8) description of her fungus, *P. fabae*, isolated from wilting broad bean plants, is very similar to the above, although there is no mention of any production of zoospores; her details are—conidia sparse, 13 to 26, average  $21.5\ \mu$  in size, oogonia 13 to 23, average  $19.7\ \mu$  in diameter. Middleton (17) is of the opinion that the differences between this species and *P. debaryanum* are not sufficient to justify retaining a separate species, and would rather consider it a strain of *P. debaryanum*.

#### HOSTS.

This fungus has been isolated only once, and that from a succulent (*Stapelia* sp.) that was infected with a soft-rot.

**Pythium debaryanum** Hesse. (= *P. debaryanum* var. *pelargonii* Braun.)

*Hyphae* are slender, 3 to 4 but sometimes up to  $6.5\ \mu$  in thickness, and much branched.

*Oogonia* are smooth-walled, spherical when terminal, or somewhat oval when intercalary; vary in size from 18 to 33, commonly  $21\ \mu$  in diameter.

*Oospores* are smooth and spherical, and range from 16 to 26, commonly  $19\ \mu$  in diameter.

*Antheridia* are one to two to each oogonium; the antheridial branch commonly coils around the oogonium for as much as half its circumference; the antheridium usually arises from a different hypha from that of the oogonium, but both have been seen on the same.

*Sporangia* are very variable in size, ranging from 9 to  $30.6$ , commonly 20 to  $23\ \mu$  in diameter, usually terminal and spherical, but often intercalary and oval shaped; germinate by the production of 1 to 8 germ tubes.

Sporangia are produced in abundance, but only rarely were oogonia seen. Although a variety of culture solutions was tried, and at different temperatures, it was not possible to induce the formation of zoospores.

The temperatures for growth are optimum 25, maximum 28 and minimum  $10^{\circ}\text{C}$ . Both this fungus and the previous one listed under the name of *P. debaryanum* (= *P. fabae*), after having been kept for a few years in culture tubes, suddenly developed a growth rate of less than half of that which they used to have. They are thus both omitted from Table 1.

The above description agrees very closely with that of *P. debaryanum* var. *pelargonii*. Braun (5) states that oogonia were 17.4 to 21.9, average 20.1  $\mu$  in size, antheridia 1 to 4, often adhering to the oogonium along the entire length, sporangia 12.8 to 27.7, average 20.1  $\mu$  in size. Sporangia were also produced in abundance, and sexual organs were very scarce. He also states that his fungus is characterised by its minimum growth temperature of 6° C.

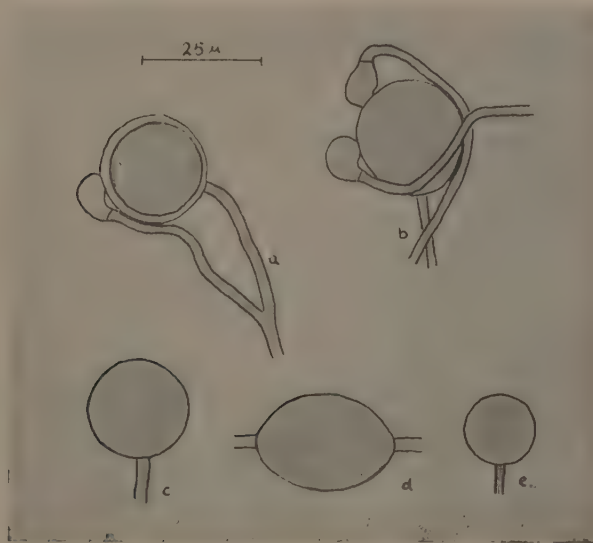


FIG. 11.—*P. debaryanum* (= *P. debaryanum* var. *pelargonii*.) (a) and (b) Oogonia and antheridia, (c) (d) and (e) sporangia.

Middleton (17) suggests that the name *P. debaryanum* var. *pelargonii* should not be retained as he regards this fungus as a minor variant of the somewhat variable species *P. debaryanum*.

#### Hosts.

This fungus was isolated once only, along with *P. ultimum*, from a wilting bean plant.



TABLE 1.—TEMPERATURE RELATIONS OF THE PYTHIUMS.

Showing the average amount of growth in mm. made by cultures of the various fungi which had been allowed to grow for two days at room temperature, and then placed in the various controlled temperature chambers for a further period of two days.

FUNGUS AND HOST.	DEGREES CENTIGRADE.												
	1	4	7	10	13	16	19	22	25	28	31	34	37
<i>P. ultimum</i> from papaw	0	2	5.5	17	31	42	51	59	67	69.5	64	34	3
<i>P. ultimum</i> from aster	0	0	6.5	19.5	32	42	50	61	70	74	73	48	6
<i>P. ultimum</i> from mesembryanthemum	0	2	7.5	16.5	28	35	46	54	63.5	60	58.5	39.5	5
<i>P. aphanidermatum</i> from papaw.....	0	0	0	3	18	31	45.5	60	77	86	99	99	98
<i>P. aphanidermatum</i> from potato.....	0	0	0	1	7	25	35	45	62	67	82	91	90
<i>P. irregulare</i> from citrus	0	9	13	20	29	36	42.5	50	55	57	47.5	21	2
<i>P. irregulare</i> from papaw.....	0	0	6	9	15	24	29	39	33	31.5	26	15.5	1.5
<i>P. vexans</i> from papaw	0	0	0	0	10	18	24	32	36	37	37	30	3
<i>P. vexans</i> from statice	0	0	0	0	9	18	25	30	36	37	37	30.5	3
<i>P. myriotylum</i> from papaw.....	0	0	1	8	19	31.5	44	54	65.5	71	81	84	83
<i>P. splendens</i> from papaw.....	0	0	1	8	19.5	34.5	41	57	61	61.5	63	42	5
<i>P. spinosum</i> from papaw.....	0	4	11	19.5	29	37.5	43.5	52.5	56	56	42.5	12	3
<i>P. acanthicum</i> from pea	0	0	0	2	11.5	19.5	23.5	30	35	34.5	34.5	28.5	17
<i>P. oligandrum</i> from antirrhinum.....	0	0	0	4	15	25	32	42	51	56.5	47.5	47	25
<i>P. oligandrum</i> from cabbage.....	0	0	0	4	14.5	25	32	44	53	54	59	49	26

### *Phytophthora infestans* de Bary.

*Hyphae* in plant tissues are 3 to 5  $\mu$  in thickness, and much branched. The sporangio-phores are from 200 to 500, or even up to 1000  $\mu$  in length, and 5 to 10  $\mu$  thick, and often have three or more side branches.

*Sporangia* are ovoid in shape, and range from 25 to 45  $\times$  15 to 26, with an average of 30  $\times$  17.5  $\mu$  in size. They readily become detached from the sporangiophores. Four to eight spores are produced in a sporangium; they are 8 to 10  $\mu$  in size, vigorously motile before rounding off and germinating.

Cultures from fresh material were made only with great difficulty. No sexual organs were seen by the writer. Tucker (23) gives the size, as reported by various workers, as oogonia ranging in average size from  $27.9$  to  $38\ \mu$ , and oospores  $23.6$  to  $35\ \mu$ ; antheridia are amphigynous.

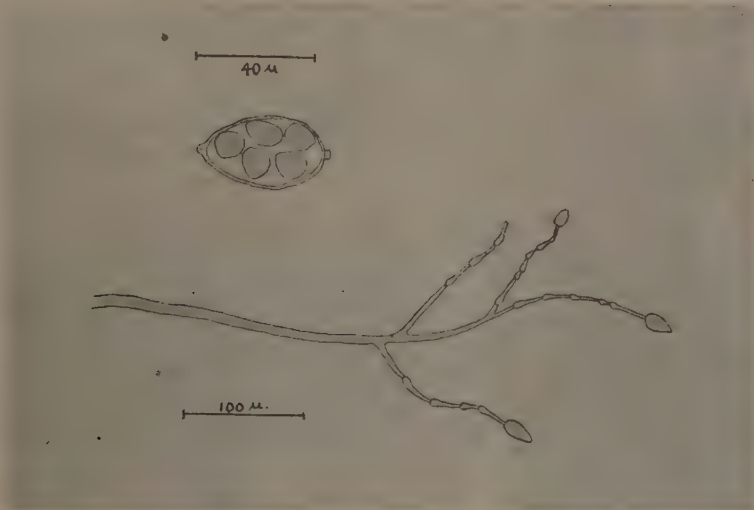


FIG. 12.—*Ph. infestans*. Sporangiophore and sporangia.

Late Blight was first recorded by E. M. Doidge on potatoes in South Africa in 1913. Since then it has occurred sporadically in certain areas of the northern Transvaal, Natal and Cape, when wet seasons occur and the temperature is low. Under such conditions, infection may be severe, and heavy losses result. It was recorded on tomatoes (9) in Natal in 1922.

#### **Phytophthora parasitica** Dast.

*Hyphae* are commonly about  $5\ \mu$  in diameter, much branched, and with numerous, short, thin side branches and projections; very much septate in old cultures; large, coiled, lobulate processes are sometimes formed.

*Oogonia* are spherical and terminal, range from  $21.6$  to  $32\ \mu$ , average  $24$  to  $27.7\ \mu$  in diameter in various strains.

*Oospores* are spherical, thick-walled and yellow to brown in colour in old cultures; range from  $17.1$  to  $29.5\ \mu$ , average  $21.5$  to  $24.8\ \mu$  in diameter in various strains.

*Antheridia* are invariably amphigynous, and commonly  $13.5\ \mu$  in size.

*Chlamydospores* are spherical, terminal; very seldom intercalary,  $16.2$  to  $45\ \mu$ , commonly  $30\ \mu$  in diameter; thick-walled and yellow-brown in colour in old cultures where they are produced abundantly.

*Sporangia* are produced on the ordinary mycelium, not on special sporangiophores; terminal, seldom intercalary; normally ovate and prominently papillate; vary greatly in size from  $31 \times 27$  to  $64 \times 46$ , in water were commonly  $50 \times 38\ \mu$ , but the average size



was much less when produced on solid media being about  $40 \times 30 \mu$ ; ratio of length to breadth 1.3 to 1.4; zoospores are produced in the sporangia and escape through the papilla, being 8 to  $11 \mu$  in size; germinate usually with one germ tube.

All the isolations mentioned below were grown in parallel series on various culture media. Variations were noted in the form of aerial mycelium produced, rate of growth, development of certain reproductive bodies readily in some and reluctantly in others, size of reproductive bodies, etc., but these variations were considered not of significant difference. Sporangia are produced abundantly, especially in water culture; chlamydospores on solid media and usually in old tubes. The sexual organs are often restricted to a few opaque white patches in which they are abundant. The optimum temperature for growth was  $25^{\circ}\text{C}$ . for the rhubarb strain, and  $28^{\circ}\text{C}$ . for the tomato strain, with a maximum of  $37^{\circ}\text{C}$ . and minimum of  $13^{\circ}\text{C}$ .

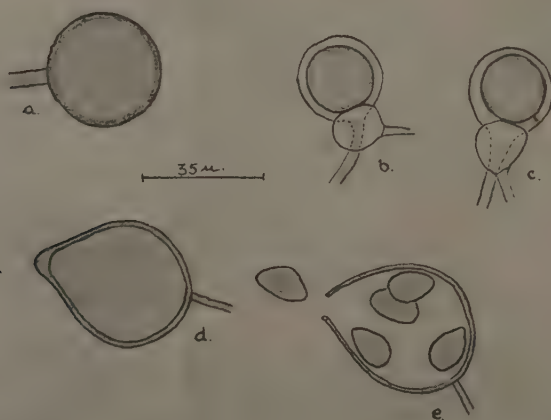


FIG. 13.—*Ph. parasitica*. (a) Thick-walled chlamydospore, (b) and (c) oogonia and amphigynous antheridia, (d) papillate sporangium, (e) sporangium and escaping zoospores.

## Hosts.

(a) *Abroad*.—*Ph. parasitica* has a wide host range and world-wide distribution. Tucker (24) has listed the published records of its occurrence, and from this it is seen that the fungus has been found on most vegetable and field crops associated with the wilting of the plants, on the roots and trunk lesions or in rotting fruits of a wide range of fruit and other trees, and in connection with root and stem rots of a large variety of garden, ornamental and greenhouse plants.

(b) *In South Africa*.—Under the name of *Ph. parasitica* var. *rhei*, which Tucker (23) suggests should be eliminated in favour of *Ph. parasitica*, the fungus has been known for many years as the cause of crown-rot of rhubarb. It has recently been isolated from infected rhubarb plants from all areas where this crop is grown in the Cape and Transvaal. Inoculation experiments on rhubarb have shown that the fungus is a virulent parasite.

In 1934 a serious outbreak of brown-rot in tomato fruits occurred in widely-separated localities in the eastern Transvaal, causing considerable damage. The responsible pathogen was identified as *Ph. parasitica* and the trouble was described by Wager (29).

This fungus has been found as the cause of a "purple-rot" of a succulent plant (*Cotyledon* sp.) in which the thick, fleshy leaves successively turned purple and rotten, Wager (25). It was also identified as being the cause of the rotting of another succulent (*Trichocaulon* sp.)

It was isolated (A. M. Bottomley) from a *Delphinium* plant which wilted suddenly.

Hopkins (15) in Rhodesia reports this fungus on *Antirrhinum majus*, *Clarkia elegans*, *Nicotiana tabacum*, *Cotyledon* sp., *Godetia* sp., *Rheum rhaponticum* and *Lilium philippinense*.

### ***Phytophthora citrophthora* (Sm.) Leon.**

*Hyphae* are much branched, with numerous irregular-shaped projections; commonly  $5\ \mu$  in diameter; may become septate in old cultures; sterile in fruit, but may form sporangia readily in cultures and moist soil.

*Oogonia* are not known to occur for this fungus.

*Sporangia* are usually ovate but may sometimes be rounded or irregular in shape; usually one pronounced papilla, sometimes two or three; on oatmeal agar the size ranged from  $22.5 \times 20.2$  to  $40.5\ \mu$  with an average of  $40.6 \times 31.3\ \mu$ , giving a ratio of length to breadth of 1.3. On plain water agar the average was slightly greater, and the ratio was 1.55. Smith (21) gives the size as  $30$  to  $90 \times 20$  to  $60\ \mu$  with an average of  $50 \times 35\ \mu$ , giving a ratio of 1.43. The sporangia produce zoospores, usually about 20, which are discharged through the papilla. They are vigorously motile, become spherical when at rest and commonly  $9\ \mu$  in diameter, and germinate by one germ tube.

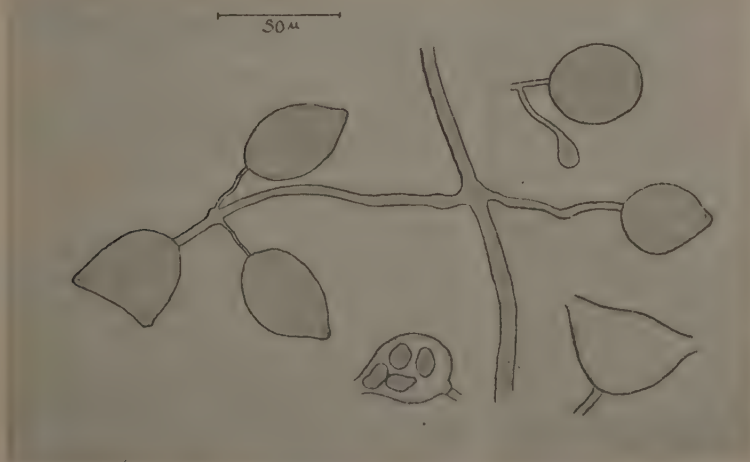


FIG. 14.—*Ph. citrophthora*. Sporangia and zoospores.

The fungus grows well on culture media. It is difficult to isolate from trunk lesions unless very fresh infections are obtained, and the inoculum taken from the junction of discoloured and healthy tissue. The isolations obtained from time to time from infected fruits or bark lesions differed only slightly from one another. The fungus isolated from grapefruit trunk made optimum growth at 25 to 28, while that from orange brown-rot was at 22 to 25, and the maximum and minimum temperatures for growth were 34 and 10°C. respectively.



## Hosts.

(a) *Abroad*.—As a disease of citrus the fungus has a world-wide distribution. Tucker (24) records that it has been isolated from bark cankers and trunk lesions, and dying seedlings from walnut varieties, avocado, apricot, sweet cherry, almond, peach, pear, spruce and pine trees. It has also been recorded from watermelon, honey-dew melon, squash and pumpkin.

(b) *South Africa*.—*Ph. citrophthora*, as the brown-rot disease of citrus fruits, first appeared in epidemic form in the western, eastern, and northern Transvaal, and two localities in the Cape, in 1925, being induced by an exceptionally wet season, and caused severe losses, Doidge (10). Since then it has appeared sporadically in the citrus areas during wet periods, especially if weeds are left standing close to the trees, thus reducing ventilation and increasing the humidity. In severe storms, the spores may splash quite high up in the tree and produce infections.

In 1930 the fungus was isolated from a grape-fruit tree infected with gummosis and collar-rot, Wager (25). This trouble occurs frequently in grape-fruit and orange trees in areas where there is a tendency for water-logging of the soil to occur. Experiments in treatment of infected trees by injecting with methylene blue were carried out by Hector and Loest (14).

It has also been recorded by Hopkins (15) and Bates (2) on citrus in Rhodesia.

**Phytophthora cactorum** (L. & C.) Schroet. (= *Ph. citricola* Sawada).

*Hyphae* are 4 to 5  $\mu$  in thickness, much branched, with numerous, short, side branches or projections.

*Oogonia* are terminal and spherical, or may have a bulbous or tubular base; vary in size from 18 to 29  $\mu$ , with an average of 23  $\mu$  in diameter.

*Oospores* are spherical and practically fill the oogonium; they have a thick, yellow wall.

*Antheridia* are 6 to 8  $\mu$  in size, and paragynous; usually one to each oogonium, rarely two.

*Chlamydospores* are terminal and spherical and have thin hyaline walls; vary from 14 to 31  $\mu$ , commonly 26  $\mu$  in size.

*Sporangia* are ovoid; in some the papilla is inconspicuous, generally it is prominent; range in size from 28.8 to 48  $\times$  12.8 to 25.6  $\mu$ , average 32  $\times$  19  $\mu$ ; are smaller when produced on solid media; may germinate directly with one or more germ tubes, or even forming other sporangia, or may produce zoospores which are actively motile and 8 to 12  $\mu$  in size.

The fungus grows well on solid media and oogonia are rapidly produced in abundance. Chlamydospores occur in old cultures. Sporangia are rare on solid media, but develop abundantly in liquid cultures.

The above description is of a fungus isolated from a wilted antirrhinum. *Ph. cactorum* was also isolated in South Africa by Mes (16) from the same host, and by Wijers (30) from carnation, verbena and sweet sultan. Mes gives oogonia ranging from 18 to 28 with an average of 23  $\mu$ , and sporangia of 26.88  $\times$  18.37, commonly 42.49  $\times$  25.33  $\mu$ ; Wijers states that the average diameter of oogonia of her various cultures ranged from 20.7 to 25.3  $\mu$ , and gives sporangia considerably smaller than those of Mes. It is evident that there can be a variation of the size of the reproductive organs in different strains of the fungus. Tucker (23) lists a considerable range in the size of oogonia as recorded by various workers, from 24 to 36  $\mu$  in diameter, commonly 26 to 28  $\mu$ ; and of sporangia as ranging from 15 to 120  $\mu$  in length, commonly 50 to 60, and an average for 10 strains of 30  $\times$  23  $\mu$ .

A fungus referable to *Ph. citricola* was isolated by E. M. Doidge from a rotting grape-fruit. Its hyphae do not have so many short side branches or projections as that described above. Its oogonia are consistently some  $6\mu$  larger, averaging  $29.3\mu$ , with a range of  $27.7$  to  $32.6\mu$ . Chlamydospores range from  $16$  to  $33$ , commonly  $28\mu$ . Sporangia in liquid culture were very irregular in shape, elongated, and prominently papillate, and ranged in size from  $42.9$ – $72.6 \times 19.8$ – $36\mu$ , with an average of  $58.4 \times 30.7\mu$ . On solid media, sporangia were smaller, ranging from  $26$ – $49.5 \times 18$ – $36$ , with an average of  $39 \times 28\mu$ . When grown in parallel series with *Ph. cactorum* from antirrhinum, both show approximately the same rate of growth, and both develop sexual organs rapidly and abundantly. The latter does not produce sporangia so readily as the former. Ashby in correspondence with the writer suggests that, although it does not fully agree with Sawada's isolation, it is a strain of *Ph. citricola*. Tucker (23) however, is of opinion that there are no significant differences between *Ph. citricola* and *Ph. cactorum*, so that the former name should be dropped. This strain from grape-fruit is thus included as *Ph. cactorum*.

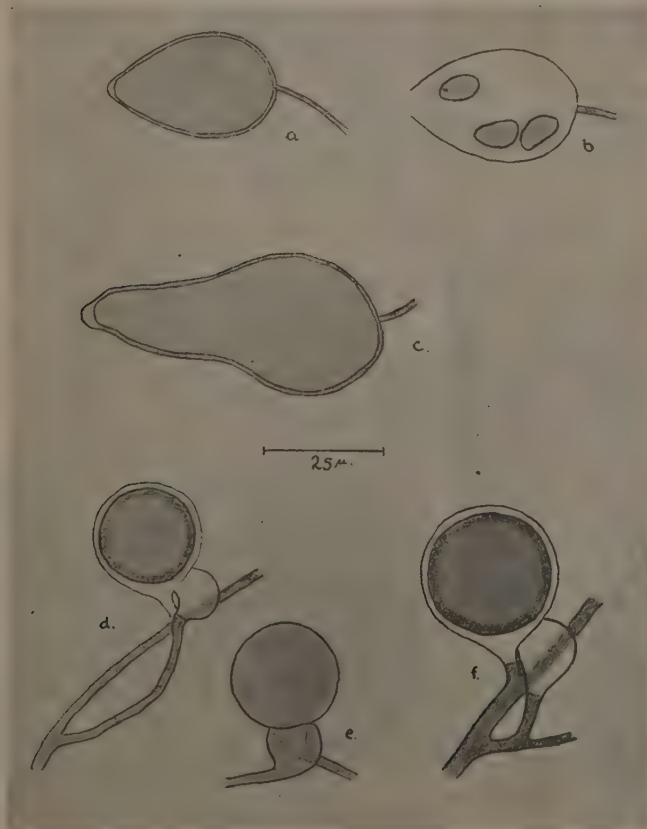


FIG. 15.—*Ph. cactorum* (= *Ph. citricola*.) (a) and (b) Sporangia from antirrhinum strain, (c) ditto from grape-fruit strain, (d) and (e) oogonia and paragonous antheridium from antirrhinum strain, and (f) ditto from grape-fruit strain.

Both cultures were grown in a series of controlled temperature incubators, and the antirrhinum strain gave minimum 4°, optimum 22°, maximum 34°, while the grapefruit fungus gave minimum 7°, optimum 19°, and maximum between 31° and 34°, which agrees with Sawada's findings of maximum of 33°C.

#### Hosts.

(a) *Abroad*.—From Tucker's (24) list of records of this fungus it is seen that it has a large range of host plants. It has been obtained from stem rots of a large variety of garden and ornamental plants, from vegetable roots and fruits, and from numerous rotting succulents. It has also been obtained frequently from roots and trunk cankers of a large variety of trees, and from wilting seedlings of a number of forest trees. Sawada (20) records his strain (= *Ph. citricola*) on fruits of *Citrus sinensis* var. *Sekkar* and *Citrus tanka* in Formosa.

(b) *South Africa*.—As mentioned above, *Ph. cactorum* was isolated by the writer and Mes from wilting antirrhinum plants, and by Wijers from carnation, verbenas and sweet sultan. Doidge isolated a strain of *Ph. cactorum* (= *Ph. citricola*) from a grapefruit affected with a kind of brown-rot from the Cape, and reported that the fungus reproduced the rot when inoculated into grapefruit.

#### *Phytophthora cinnamomi* Rands.

*Hyphae* are up to 10  $\mu$ , commonly 6.5  $\mu$  in thickness, and much branched; often irregular-shaped protrusions are formed on the hyphae in masses; older hyphae may become brown in colour and septate; the aerial mycelium, especially in older cultures, becomes very tough and wiry.

*Oogonia* are terminal and spherical, each with a broad, funnel-shaped base within the antheridium, varying in size from 30 to 52, being commonly 42  $\mu$  in diameter, (average size of 50 was 41.4  $\mu$ ); are a brilliant brown in colour.

*Oospores* are spherical and thick-walled, and fill the oogonia completely.

*Antheridia* are amphigynous, one to each oogonium, somewhat spherical in shape being about 15  $\mu$  in size, or may be oblong and  $24 \times 12$   $\mu$  in size; may be transparent or opaque, and also stained the same brilliant brown colour as the oogonium.

*Chlamydospores* are spherical, thin-walled, may be borne singly, more usually in groups or bunches of 3 to 12; they range from 26 to 43, commonly 32  $\mu$  in diameter.

*Sporangia* are borne on very thin hyphae; are oval or elongate in shape, and have no papilla; range in size from 39 to 66 by 26 to 40, commonly 50 by 32  $\mu$ ; may germinate by one or more germ tubes, and may proliferate, the contents of one sporangium passing up a tube to form another; zoospores may also be produced.

The fungus is characterised by its peculiar irregular or 'knobby' hyphae, the fact that chlamydospores are produced abundantly, usually in grape-like clusters, and by the complete absence of oogonia in ordinary cultures. The fungus was grown for many years on all varieties of culture media without any oogonia ever being produced. They were finally obtained in large numbers in a few oatmeal agar and watermelon-seed agar tubes that were left standing during autumn on a shelf in the laboratory. The oogonia were numerous in some areas on the cultures, especially at the top end of the tube, both in the aerial mycelium and in the agar where it was about  $\frac{1}{4}$ -inch thick.

Sporangia were obtained when portions of a culture were placed either in Petri's solution, or soil-extract solution.

The fungus has minimum 10, optimum 25, and maximum 34°C. temperatures for growth.



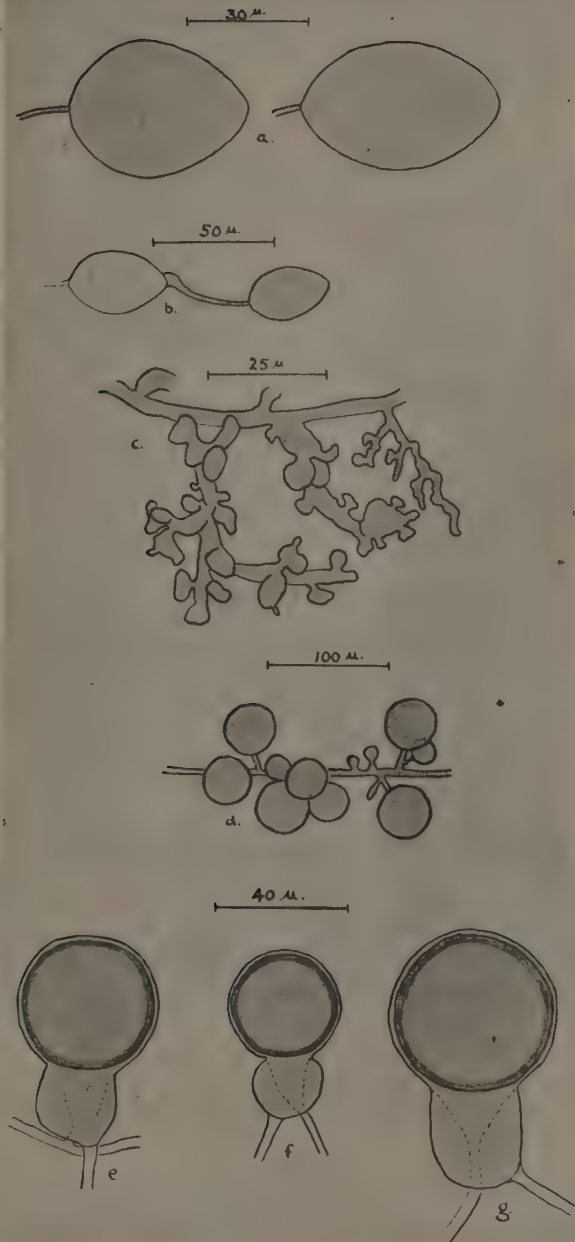


FIG. 16.—*Ph. cinnamomi*. (a) Sporangia, (b) proliferating sporangium, (c) showing the knobby nature of the mycelium, (d) a bunch of chlamydospores, (e), (f) and (g) oogonia and amphigynous antheridia.

Rands (18) in the original description of this fungus gives the chlamydospores as being somewhat larger than those described above, namely 26 to 60, commonly 31 to 50, average  $41\ \mu$  in diameter, but sporangia more or less the same as above, being  $38$  to  $84 \times 27$  to  $39$ , average  $57 \times 33\ \mu$ . He was unable to find oogonia. Ashby (1) obtained oogonia on an old culture of cornmeal agar, average  $32\ \mu$  in diameter. Tucker (23) induced the development of oogonia,  $28.1\ \mu$  in diameter, when mycelium was placed in M/100 potassium nitrate.

This fungus was mentioned by Wager (25) under the name of *Ph. cambivora* as isolated from rotting roots of the avocado. More recently Ashby is of opinion that the fungus goes better into *Ph. cinnamomi* than *Ph. cambivora*, and Tucker confirms this.

#### HOSTS.

(a) *Abroad*.—From Tucker's list (24), *Ph. cinnamomi* is noted to have been reported from pineapple stems and leaves, erica, rhododendron, and from the bark cankers and rotting roots of numerous species of chestnut, walnut, cinnamon, and on the blackened feeding roots of avocado.

(b) *South Africa*.—*Ph. cinnamomi* has been isolated once only (E. M. Doidge) from decaying avocado roots.\*

#### *Phytophthora cryptogea* Pethyb. and Laff.

*Hyphae* are branched, commonly  $5\ \mu$  thick; may develop circular or irregular-shaped vesicles, often in groups.

*Oogonia* are spherical and terminal, with a narrow, funnel-shaped base within the antheridium; vary in size from  $24$  to  $54\ \mu$  in diameter, commonly  $40$  (average of  $50$  being  $38.4\ \mu$ ); they are light-brown in colour.

*Oospores* are spherical and thick-walled, and some  $3$  to  $4\ \mu$  less in diameter than the oogonia.

*Antheridia* are amphigynous, one to each oogonium, somewhat spherical or oblong in shape, commonly  $12$  to  $15\ \mu$  in size.

*Sporangia* are usually oval in shape, may be irregular or elongate, and are non-papillate; they range from  $22.8$  to  $68.5$  by  $16.3$  to  $35.8$ , commonly  $35$  by  $23\ \mu$  in size; the sporangia may germinate directly with the production of a germ tube, or the contents of one may pass out to form another, or a sporangiophore may grow up through the old sporangium; zoospores may be produced, they are large,  $13$  to  $15\ \mu$  in size, and from  $3$  to  $15$  are produced in each; they are vigorously motile at first, then round off to about  $12\ \mu$  and germinate.

The fungus makes profuse mycelial growth, filling the aerial portion of the Petri dish or tube, and is characterised by the absence of all types of reproductive organs in ordinary cultures.

Sporangia were formed in abundance after six days in Petri's solution, or in non-sterile soil extract. Tucker (23) states that his culture of this fungus produced sporangia  $25$  to  $49$  by  $16$  to  $29$ , average  $36.7$  by  $21.9\ \mu$  in size.

Oogonia and antheridia were at last found in a tube of oatmeal agar which had been subjected to varying temperatures, such as a few months in an ice-box, then room temperature, the ice-box again, and finally three months on a shelf in the laboratory. In the

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\* Foot note.—Since going to press, *Ph. cinnamomi* has been found by the writer on avocado roots both from the western Transvaal and Natal, where the trees were suffering from die-back or decline. Experiments have shown that where excessive water was present, the fungus was rapidly able to kill off the plants.

original description of this fungus, oogonia averaging  $30\ \mu$  in diameter were found in an old culture of oatmeal agar. Tucker obtained oogonia averaging  $25.8\ \mu$  in diameter in an old oatmeal culture subjected to winter temperatures.

The fungus makes good growth at  $4^{\circ}\text{C}$ ., not below, optimum 22, and good growth up to 34, but none at  $37^{\circ}\text{C}$ .

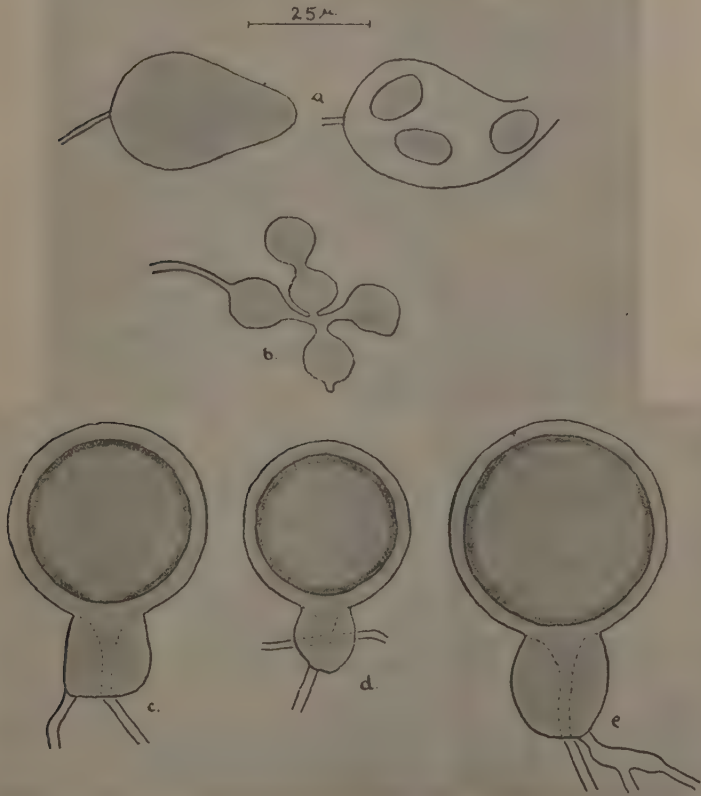


FIG. 17.—*Ph. cryptogea*. (a) Sporangia, (b) irregular-shaped processes occurring on the hyphae, (c), (d) and (e) oogonia and amphigynous antheridia.

#### Hosts.

(a) *Abroad*.—According to Tucker's list (24), *Ph. cryptogea* is a fairly common parasite in decayed or discoloured roots and stems of garden and ornamental flowers, and of a few vegetables, namely, aster, cineraria, wallflower, lupine, iceland poppy, gilia, antirrhinum, petunia, gladiolus, tulip, turnip, strawberry, tomato and celery.

(b) *South Africa*.—This fungus has been obtained once only (A. M. Bottomley) from a wilting godetia plant.



**Phytophthora syringae** Kleb (= *Ph. hibernalis* Carne).

*Hyphae* are much branched, commonly  $4.5\ \mu$  in thickness or less, and septate in old cultures.

*Oogonia* are terminal and spherical; commonly  $35.2$ , ranging from  $26$  to  $40\ \mu$  in diameter.

*Oospores* are spherical and almost fill the oogonium; are slightly tinged with a yellow or brown colour.

*Antheridia* are both amphigynous and paragynous, although the former type predominates.

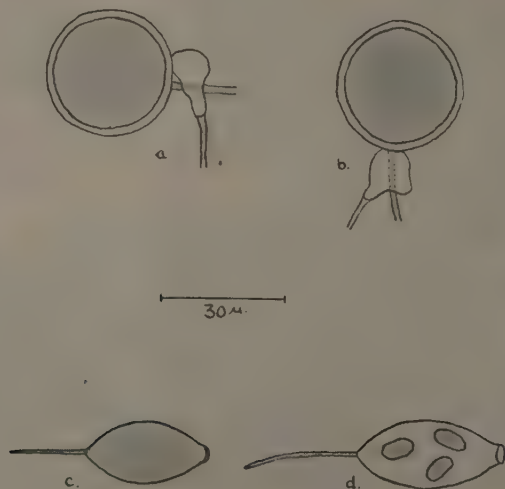


FIG. 18.—*Ph. syringae* (= *Ph. hibernalis*) (a) Paragynous and (b) amphigynous antheridium and oogonium, (c) and (d) sporangia with persistent pedicels.

*Sporangia* are formed on very slender branches of the mycelium; they are elliptical and vary from  $26$  to  $57$  by  $15$  to  $25$ , commonly  $37.5$  by  $20\ \mu$  in size. The sporangium has a broad and pronounced papilla; the sporangium readily becomes detached from the mycelium, but retains a portion of the pedicel which may be from  $20$  to  $50\ \mu$  in length, more commonly about the same length as the sporangium; the sporangium may germinate with the production of a germ tube, or zoospores may be formed; these are approximately  $10\ \mu$  in length, and after moving vigorously for a time come to rest and germinate.

The fungus grows very slowly on culture media; oogonia are formed readily on most agars, and sporangia were produced on Petri's agar. The optimum temperature for growth was  $13$  to  $16$ , minimum  $7$  and maximum  $19^{\circ}\text{C}$ .

The above description agrees fairly closely with that of *Ph. hibernalis* by Carne (7), except that the oogonia are on the average somewhat smaller. Carne's figures are sporangia average  $34.6$  by  $16.1$ , range of  $17$  to  $56$  by  $10$  to  $21\ \mu$ , and oogonia average  $40.8$ , ranging from  $22.4$  to  $56\ \mu$  in diameter. Bensaude (3) gives the following figures: sporangia  $41$  by  $19$ , range of  $25.2$  to  $54$  by  $12.6$  to  $27$  (smaller when grown on solid media), oogonia  $35.17$ , range of  $19.8$  to  $44\ \mu$  in diameter; he also states that the optimum temperature is  $18$  to  $20$ , minimum  $12$ , and maximum  $24^{\circ}\text{C}$ .

Tucker (23) includes *Ph. hibernalis* in the species *Ph. syringae*, but the former name appears to be the one commonly used by citrus pathologists.

#### HOSTS.

(a) *Abroad*.—*Ph. syringae* has been isolated from common lilac (*Syringa vulgaris*) and pear and apple fruits in Europe; under the name of *Ph. hibernalis* it has been recorded as a serious fruit-rot, leaf-blight and twig die-back of citrus in Australia, Portugal and California, Tucker (24).

(b) *South Africa*.—This fungus has been isolated only once (Doidge), from oranges showing brown-rot symptoms from the Fish River Valley in the eastern Cape.

TABLE 2.—TEMPERATURE RELATIONS OF THE PHYTOPHTHORAS.

Showing the average amount of growth in mm. made by cultures of the various fungi which had been allowed to grow for four days at room temperature and then placed in the various controlled temperature chambers for a further period of four days.

FUNGUS AND HOST.	DEGREES CENTIGRADE.												
	1	4	7	10	13	16	19	22	25	28	31	34	37
<i>Ph. parasitica</i> from rhubarb crown-rot..	0	0	0	0	5.5	23.5	31.5	40	44	43.5	42	28	6
<i>Ph. parasitica</i> from tomato fruit brown-rot	0	0	0	0	7	13	24.5	26	36	37.5	34	29.5	5
<i>Ph. citrophthora</i> from grapefruit trunk gummosis.....	0	0	0	5	13	20	22	25.5	32	31.5	27.5	2	0
<i>Ph. citrophthora</i> from orange fruit brown- rot.....	0	0	0	5.5	13.5	19	27	29	28.5	25	20	2	0
<i>Ph. cactorum</i> from antirrhinum wilt....	0	2.5	5.5	10	16	23	35	39.5	36.5	35	15	3.5	0
<i>Ph. cactorum</i> from orange fruit rot....	0	0	4	10	15	22	27.5	26.5	24	23.5	5	1.5	0
<i>Ph. cinnamomi</i> from avocado root rot....	0	0	0	2.5	11	22.5	30.5	38	41	37	22.5	2	0
<i>Ph. cryptogea</i> from Godetia wilt.....	0	3	8.5	13.5	17	23	30.5	39	36.5	35.5	32.5	28.5	1
<i>Ph. syringae</i> from grapefruit brown rot	0	0	4	8	11	11	1	0	0	0	0	0	0

# ANNOTATED HOST INDEX. ---

- Aster** (*Callistephus chinensis* Nees.)  
WILT. *P. ultimum*.
- Avocado** (*Persea americana* Mill.)  
DECAYED ROOTS. *Ph. cinnamomi*.
- Bean** (*Phaseolus vulgaris* L.)  
WILT. *P. ultimum*.  
*P. debaryanum* (= *P. debaryanum* var. *pelargonii*.)
- Bracken** (*Pteridium aquilenum*)  
WILT. *P. aphanidermatum*.
- Brinjal** (*Solanum melongena* L. var. *esculentum* Nees.)  
FRUIT ROT. *P. aphanidermatum*.
- Cabbage** (*Brassica oleracea* L.)  
WILT. *P. oligandrum*.  
HEART ROT. *P. ultimum*.
- Carnation** (*Dianthus caryophyllus* L.)  
WILT. *Ph. cactorum*.
- Chou-Chou** (*Sechium edule* Sw.)  
FRUIT ROT. *P. aphanidermatum*.
- Dahlia** (*D. variabilis* Des.)  
DAMPING-OFF. *P. acanthicum*.  
*P. ultimum*.
- Delphinium** (*D. sp.*)  
WILT. *P. ultimum*.  
*Ph. parasitica*.
- Gilia** (*G. rubra* Heil.)  
WILT. *P. ultimum*.
- Godetia** (*G. sp.*)  
WILT. *Ph. cryptogea*.
- Grapefruit** (*Citrus grandis* Os.)  
FRUIT ROT. *Ph. cactorum*. (= *Ph. citricola*.)  
TRUNK GUMMOSIS. *Ph. citrophthora*.
- Iceland Poppy** (*Papaver nudicaule* L.)  
WILT. *P. ultimum*.  
DAMPING-OFF. *P. ultimum*.
- Marrow** (*Cucurbita pepo* L.)  
WILT. *P. oligandrum*.
- Nasturtium** (*Tropaeolum majus* L.)  
WILT. *P. ultimum*.
- Orange** (*Citrus sinensis* Os.)  
FRUIT ROT. *P. irregulare*.  
*Ph. citrophthora*.  
*Ph. syringae* (= *Ph. hibernalis*).  
TRUNK GUMMOSIS. *Ph. citrophthora*.  
WITHIN NAVEL-END OF YOUNG FRUIT. *P. ultimum*.



**Papaw** (*Carica papaya* L.)

- FOOT ROT. *P. ultimum*.  
*P. aphanidermatum*.  
*P. splendens*.  
*P. myriotylum*.  
*P. vexans*.  
*P. irregulare*.  
*P. spinosum*.

**Pea** (*Pisum sativum* L.)

- WILT. *P. ultimum*.  
*P. acanthicum*.

**Peanut** (*Arachis hypogaea* L.)

- WILT. *P. ultimum*.

**Pine** (*Pinus* sp.)

- DAMPING-OFF. *P. ultimum*.

**Pink** (*Dianthus plumarius*).

- WILT. *P. ultimum*.

**Potato** (*Solanum tuberosum* L.)

- LEAF BLIGHT AND TUBER ROT. *Ph. infestans*.  
 TUBER SOFT-ROT OR "LEAK". *P. aphanidermatum*.

**Rhubarb** (*Rheum rhaponticum* L.)

- CROWN ROT. *Ph. parasitica*.  
*P. ultimum*.

**Shirley Poppy** (*Papaver Rhoeas* L.)

- WILT. *P. oligandrum*.

**Snapdragon** (*Antirrhinum majus*).

- WILT. *Ph. cactorum*.  
*P. oligandrum*.

**Squash** (*Cucurbita pepo*).

- WILT. *P. aphanidermatum*.

**Statice** (*Armeria* sp.)

- WILT. *P. vexans*.

**Succulents**—producing rots of

- Aloe variegata*. *P. ultimum*.  
*Cotyledon* sp. *Ph. parasitica*.  
*Delosperma* sp. *P. ultimum*.  
*Dinteranthus microspermus*. *P. ultimum*.  
*Duvalia parvifolia*. *P. ultimum*.  
*Fenesturia aurantiaco*. *P. ultimum*.  
*Mesembryanthemum* sp. *P. ultimum*.  
*Stapelia* sp. *P. ultimum*.  
*P. debaryanum* (= *P. fabae*).  
*Tavaresia* sp. *P. ultimum*.  
*Trichocaulon* sp. *Ph. parasitica*.

**Sweet Pea** (*Lathyrus odoratus* L.)

- WILT. *P. ultimum*.

**Sweet Potato** (*Ipomoea batatas* Poir.)

- TUBER ROT. *P. ultimum*.

**Sweet Sultan** (*Centaurea moschata*).WILT. *Ph. cactorum*.**Tobacco** (*Nicotiana tabacum* L.)WILT. *P. ultimum*.*P. aphanidermatum*.DAMPING-OFF. *P. aphanidermatum*.**Tomato** (*Lycopersicum esculentum* Mill.)LEAF BLIGHT. *Ph. infestans*.WILT. *P. aphanidermatum*.*P. ultimum*.WILTING TRANSPLANTS. *P. aphanidermatum*.FRUIT ROT. *Ph. parasitica*.*P. aphanidermatum*.**Verbena** (*V. hybrida* Voss.)WILT. *Ph. cactorum*.**Witchweed** (*Striga lutea*.)WILT. *P. ultimum*.

## LIST OF REFERENCES.

1. ASHBY, S. F. .... The Production of Sexual Organs in Pure Cultures of *Phytophthora cinnamomi* Rands and *Blepharospira camivora* Petri. Trans. Brit. Mycol. Soc. 14 : 260-263, 1929.
2. BATES, G. R. .... Diseases of Citrus Fruits in Southern Rhodesia. Ann. Rep. Mazoe Citrus Exp. St. for 1936-37 : 173-207, 1937.
3. BENSAUDE, M. .... Note Sur le *Phytophthora* Parasite des Citrus au Portugal. Comptes rendus Soc. de Biol. 24 : 982-4 : 1929.
4. BRAUN, H. .... Geranium Stem-rot caused by *Pythium complotens* N. Sp. Jour. Agric. Res. 29, 399-419 : 1924.
5. BRAUN, H. .... Comparative Studies of *Pythium debaryanum* and Two Related Species from Geranium. Jour. Agr. Res. 30, 1043-1062 : 1925.
6. BUISMAN, C. J. .... Root Rots Caused by *Phycomycetes*. Thesis Univ., Utrecht, 1927.
7. CARNE, W. M. .... A Brown Rot of Citrus in Australia (*Phytophthora hibernalis*, N.Sp.) Jour. Roy. Soc., W. Australia, 12, 13-41 : 1925.
8. CHENEY, G. M. .... Pythium Root-rot of Broad Beans in Victoria. Aus. Jour. Exper. Biol. & Med. Sci. 10, 3, 143-155 : 1932.
9. DOIDGE, E. M. and BOTTOMLEY, A. M. .... A Revised List of Plant Diseases Occurring in South Africa. Bct. Sur. of S.A. Mem. 11, 1-78 : 1931.
10. DOIDGE, E. M. .... Brown Rot in Citrus Fruits. U.S. Africa Jour. Dept. Agric. 10, 499-503 : 1925.
11. DRECHSLER, C. .... *Pythium ultimum* and *Pythium debaryanum*. Phytopath, 17, 54-5 : 1927.
12. DRECHSLER, C. .... Some New Species of *Pythium*. Jour. Wash. Acad. Sci. 20, 398-418 : 1930.
13. FAWCETT, H. S. .... Citrus Diseases and Their Control. McGraw-Hill Co., 1-656 : 1936.
14. HECTOR, J. M. and LOEST, F. C. .... Preliminary Note on Brown Rot Gummosis of Citrus in the Eastern Cape. S. Afr. Journ. Sc. Vol. 33, 1937.
15. HOPKINS, J. C. .... Diseases of Tobacco in Southern Rhodesia. Rhod. Agric. Jour. 36 : 1939.

16. MES, M. G..... A Wilt of Snapdragon (*Antirrhinum majus*) in South Africa. S.A. Jour. Sci., 281-287: 1934.
17. MIDDLETON, J. T..... Taxonomy of the genus *Pythium* Fringsheim. In Press.
18. Rands, R. D..... Streepkanker van Kaneel, Veroorzaakt door *Phytophthora cinnamomi* N.Sp. Dept. Landb. Inst. Pl. Nig. Hand. Med. 54, 1-53: 1922.
19. SAWADA, K. and K. CHIN.... Formosa Nat. Sci. Bul. 28: 1926.
20. SAWADA, K..... Descriptive Catalogue of the Formosan Fungi, Part 3. Rept. 27, Gov. Res. Inst. Formosa: 1927.
21. SMITH, R. E. and E. H..... A New Fungus of Economic Importance. Bot. Gaz. 42, 215-221: 1906.
22. TROW, A. H..... Observations on the Biology and Cytology of *Pythium ultimum*, N.Sp. Anns. Bot. 15, 269-312: 1901.
23. TUCKER, C. M..... Taxonomy of the Genus *Phytophthora* de Bary. Mo. Agric. Exp. St. Res. Bull. 153, 1-208: 1931.
24. TUCKER, C. M..... The Distribution of the Genus *Phytophthora*. Mo. Agric. Exp. St. Res. Bull. 184, 1-80: 1933.
25. WAGER, V. A..... Diseases of Plants in South Africa due to Members of the *Pythiaceae*. U. So. Afr. Dept. Agric. Bull. 105, 1-43: 1931.
26. WAGER, V. A..... Foot-rot Disease of Papaws. Farm. in So. Afr., Jan. 1932.
27. WAGER, V. A..... "Leak" or Soft-rot Disease of Potatoes. Farm. in So. Afr., Feb. 1932.
28. WAGER, V. A..... A Stem Rot of Transplanted Tomatoes Due to *Pythium aphanidermatum* (Eds.) Fitz. So. Afr. Jour. Sci. 30, 247-249: 1933.
29. WAGER, V. A..... Brown Rot of Tomato Fruits Due to *Phytophthora parasitica* Dast. So. Afr. Journ. Sci. 32, 235-237: 1935.
30. WIJERS, E. E..... *Phytophthora* Wilt in Carnation Plants. So. Afr. Jour. Sci. 34, 194-213: 1937.





## NEWLY DESCRIBED SPECIES AND NEW COMBINATIONS.

**Chlorophytum longipedunculatum** H. Forbes sp. nov. *Affine C. elato sed scapo longiore et robustiore foliis longioribus et latioribus differt.*

*Folia* viridia, usque 1·36 m. longa et 6·5 cm. lata, lanceolata, prope 50 costis distinctis, glabra, marginibus angustis membranaceis albidis. *Pedunculus* ramosus, usque 1·6 m. longus; bractee inferiores usque 17 cm. longae ad 3·3 cm. latae, sensim diminuatae; superiores 2 cm. longae. *Flores* 4-6-nati in axillis bractearum. *Pedicelli* graciles, 1·5 cm. longi, supra medium articulati. *Perianthum* album; segmenta 1·6-1·7 cm. longa, 6-7 mm. lata; 3 exteriora apice extus virida. *Filamenta* 5 mm. longa; antherae 6 mm. longae, lineares, erectae, interlobos basales dorso affixae. *Ovarium* sessile, triquetrum.

### TRANSVAAL.

Nelspruit distr.: Sabie, *Pole Evans in Nat. Herb.* 4247 (type). Rustenburg distr.: Rustenburg, *Pole Evans in Nat. Herb.* 10026.

This is a strikingly conspicuous plant when in bloom as its long peduncle bears panicles of pure white starry flowers, only the three outer perianth-lobes being tipped with green. Its nearest affinity appears to be *Chlorophytum elatum* R. Br., but it has a much longer and more robust flowering scape than that species, also its leaves are much longer and broader. The description is based on specimens collected by Dr. I. B. Pole Evans and which flowered at Irene, near Pretoria, in December, 1939.

Two specimens in the Transvaal Museum appear to be very close to this species, namely, *Stewart* (T.M. 9640), collected in Swaziland, and *Obermeyer* 2166, collected on Mt. Silinda, on the outskirts of Chirinda Forest, S. Rhodesia, but in both cases the material is insufficient for a definite determination.

**Kalanchoe albiflora** H. Forbes sp. nov. *K. thyrsiflorae* Harr. affinis sed colore et forma floris et inflorescentia differt.

*Herba* succulenta, biennis. *Caulis* erectus, crassus, 1-1·5 m. altus, leviter 4- angularis. *Folia* decussata, usque 18 cm. longa et 15 cm. lata (juniora gradatim reducta), supra leviter concava, infra leviter convexa, basi connata et decurrentia, glaberrima: seniores marginibus distincte rubris. *Inflorescentia* paniculata, multiflora. *Pedunculus* simplex vel semel vel bis dimidiatus. *Bractee* alternae; inferiores usque 7 mm. longae et 2·5 mm. latae, ovatae, sensim diminuatae. *Flores* in scorpiodi-cymis. *Pedicellus* usque 1 cm. longus. *Calyx* 4 mm. longus, 2·5 mm. latus; lobi ovato-obtusi. *Corolla* 1·2 cm. longa, 8 mm. lata, urceolata, leviter 4- angularis; lobi albidii, 5-6 mm. longi, 2·5-3 mm. lati, ovati, obtusi. *Stamina* 8, biseriata, ad medium corollae inserta; filamenta applanata, 5-6 mm. longa. *Carpella* 4, 1·15 cm. longa; stylus simplex. *Squamae* 1·5 mm. longae, 2 mm. latae. *Semina* parva, fusca.

### ZULULAND.

Ubombo, *Gerstner in Nat. Herb. Pretoria*, 26434, (type) and *Natal Herb. Durban*.

Natal:—Ngotshe distr.: Mooiklip near Louwsberg, *Verdoorn* 1696, 1720.

### TRANSVAAL.

Barberton distr.: Rocky ridges, Barberton, *Galpin* 1353. Lydenburg distr.: Suku-kunie, *Barnard* 328.

A tall handsome plant very similar in appearance to *K. thyrsiflora* Harv. from which it differs in the scorpioid cymose inflorescence and pure white or creamery white urceolate corolla. The whole plant is covered with a white powdery bloom, often less dense on the lower leaves.

**Galpinia paviflora** H. Forbes sp. nov. *affinis G. transvaalica* N.E. Br. *paniculo laxiore floribus minoribus foliis differt.*

*Arbor parva, ramulis tetragonis. Folia supra viridia, infra pallidiora, breviter petiolata, 2.5-8.5 cm. longa, 1-3 cm. lata, oblonga vel obovata vel elliptico-obovata, obtusa, apice recurva, costa subtus infra apicem glandulifera, basi cuneata vel cuneato-rotundata. Paniculae terminales et axillares, multiflorae, bractae foliiformae, 0.5-1.5 cm. longae, 0.1-1.4 cm. latae, majores foliis similes. Pediceli tetragoni, 2 mm. longi. Calycis tubus campanulatus, 5-6-dentatus, persistens; dentibus triangularibus acutis apicem versus breviter ciliatis, sinibus dentatis. Petala 5-6, fauci calycis inserta, lanceolata, 2-3 mm. longa, 1 mm. lata. Stamina 5-6, 4 mm. longa, infra medium tubi calycis inserta, filamentis exsertis, antherae didymae. Ovarium sessile, imperfecte 2-loculare, apud 1 mm. longum et latum; stylus 3mm. longus, filiformis.*

#### ZULULAND.

Hluhluwe Game Reserve. Gerstner 3182, in *Nat. Herb. Pretoria and Natal Herb. Durban* (type).

In Kew Bulletin 1894, p. 345, N. E. Brown described a new genus, *Galpinia*, which he named in honour of Dr. E. E. Galpin who collected the type material. For many years only the one species, *G. transvaalica* N.E.Br. was known, then a second species, described here, was collected in Zululand by the Rev. Father J. Gertsner. This species is distinguished from *G. transvaalica* by its looser panicle, smaller flowers and by its leaves, which are not so thick or opaque as those of *G. transvaalica*. The native name for this tree is „umPisamakasa” and Father Gerstner states that “the leaves are liked by the black rhino”.

**Stachys villosissima** H. Forbes sp. nov. *Affinis S. Galpini* Briq., *inflorescentia laxiore et calycis laciniis longioribus et acutioribus differt.*

*Herba villosissima, basi ramosa, ramis decumbentibus vel ascendentibus, simplicibus vel interdum ramulosis. Folia subsessilia vel breviter petiolata, 0.6-2 cm. longa, 0.7-1.8 cm. lata, ovata vel ovato-cordata, marginibus dentatis, villosissima. Inflorescentia laxa, verticillastri 2-flori. Bractae inferiores foliis similes; superiores maxime reductae, lanceolatae, dense villosae. Flores brevissime pedicellati. Calyx 7-9 mm. longus, 6-8 mm. latus; tubus campanulatus, 10-nervatus, dense villosus; lacinae 2.5-3 mm. longae, lanceolatae, acutae, setaceae. Corollae tubus cylindraceus, 6 mm. longus; limbus 2-labiatus, labio postico erecto, ovato, 3 mm. longo, antico patente 3-fido, lobo medio maximo, 3 mm. longo. Stamina 4, didynama. Stylus apice 2-fidus, 8 mm. longus. Nuculae parvae, fuscae.*

#### ZULULAND.

Eshowe, Forbes, 722 in *Natal Herbarium, Durban*; Entumeni: Forbes 783 (type) in *Natal Herbarium, Durban* and *National Herbarium, Pretoria*.

A small plant generally growing among grass. All parts, except the flowers, are densely villous. The flowers are white or very pale lilac and are arranged in lax 2-flowered verticels.

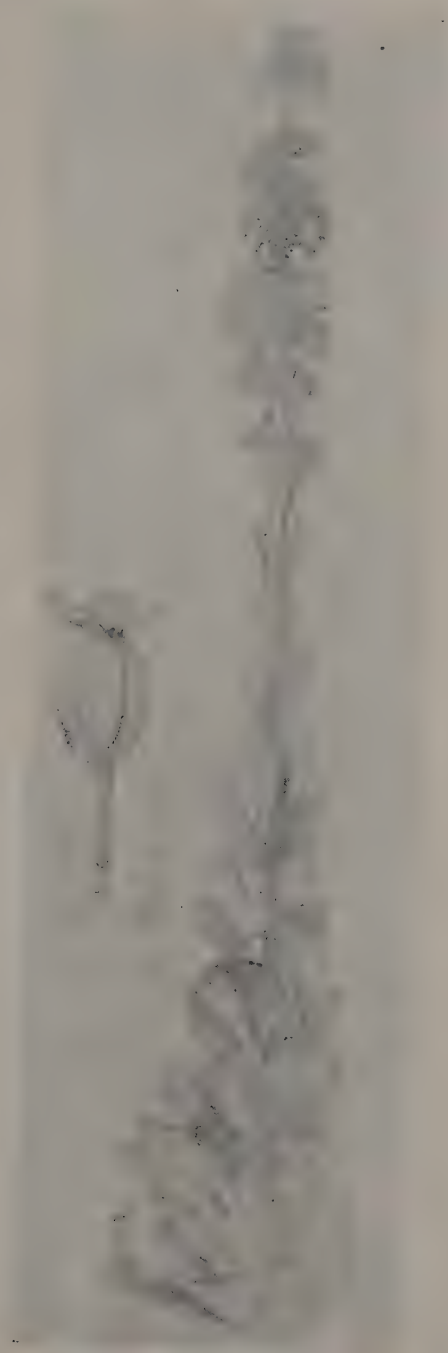
**Brachystelma Dinteri** (Schltr.) Phill. comb. nov.

(*Blepharanthera Dinteri* Schltr.).

**Brachystelma Inandensis** Phill. <sup>nam.</sup> comb. nov.

(*Aulostephanus natalensis* Schltr.).





*Kalanchoe albiflora* H. Forbes.



**Caralluma Winkleriana** (Dinter) Phill. comb. nov.  
 (*Saracophagophilus Winklerianus* Dinter).

**Tenaris Schultzei** (Schltr.) Phill. comb. nov.  
 (*Kinepetalum Schultzei* Schltr.)

**Ruellia velutina** (C.B.Cl.) Phill. comb. nov.  
 (*Dinteracanthus velutinus* C.B.Cl.)

**Ruellia asper** (C.B.Cl.) Phill. comb. nov.  
 (*Dinteracanthus asper* C.B.Cl.)

**Ruellia Marlothii** Engl.  
 [*Dinteracanthus Marlothii* (Engl.) C.B.Cl.]

**Felicia australis** (Alston) Phill. comb. nov.  
 (*Psednotrichia australis* Alston.)





# A NOTE ON N. E. BROWN'S SUB-DIVISION OF THE GENUS *ANTHOLYZA* LINN.

By E. P. Phillips.

In the Transactions of the Royal Society of South Africa [vol. 20, p. 265 (1932)], Dr. N. E. Brown contributed an interesting paper on the genus *Antholyza* Linn. He pointed out the confusion that had resulted from a wrong conception of Linne's genus, and that many very different plants had been placed in this genus that could not legitimately find a home there. In place of the one commonly recognised genus, Brown proposed nine separate genera for all the species hitherto included in the genus *Antholyza*. Two of his nine genera are genera proposed by Salisbury over one hundred years ago; six genera are described by Brown for the first time; the ninth genus being *Antholyza* Linn.

In looking through the specimens in the National Herbarium named by Dr. Brown, the writer considers that Brown has succeeded in clearing up much of the prevailing confusion though he has gone too far in proposing so many genera. In the writer's opinion the genera *Pentamenes* Salisb., *Kentrosiphon* N.E.Br., *Chasmanthe* N.E. Br., and *Anomalesia* N.E. Br., should be grouped together under the oldest name *Pentamenes* Salisb. All these genera are characterised by the elongated upper perianth-lobe which is differently shaped to the other five lobes and are concave or hooded. This appears to be a very natural grouping but the subsidiary characters used by Brown to separate the genera e.g., the saccate perianth-tube of *Kentrosiphon*, the reflexed perianth-lobes of *Anomalesia*, and the slight differences he gives between *Pentamenes* and *Chasmanthe* do not warrant generic status.

The genera as now proposed may be keyed out as follows:—

1. Stem bearing one dense sessile lateral spike near its base and continued beyond it as a naked stem with some barren bracts or with one flower at its apex ..... *Antholyza* Linn.  
 Stem simple or branched, with the stem or branches ending in a lax or dense spike of flowers ..... 2
2. Stem branched so that whole inflorescence is a panicle of spikes *Curtous* N.E. Br.  
 Stem simple or branched, but whole inflorescence not paniculately arranged ..... 3
3. Stem with 2-4 dense sessile lateral spikes and one terminal spike *Anaclanthe* N.E.Br.  
 Stem usually unbranched, sometimes branched in *Pentamenes* 4
4. Upper lobe of flower much longer than the other five, differently shaped and concave or hooded, with the stamens under the hood and about equalling or exceeding it *Pentamenes* Salisb.  
 All lobes of the flower either sub-equal and similar in form and flat, or unequal with the five lower lobes gradually smaller but all similar in form and the upper not hooded 5
5. Flower-spike dense, 10-30-flowered; bracts hard, rigid, with the inner longer than the outer ..... *Anapalina* N.E.Br.  
 Flower-spike lax, 1-7-flowered; bracts herbaceous, with the outer longer than the inner ..... *Homoglossum* Salisb.

**PETAMENES** Salisb. ex N.E. Br. emend.

(*Kentrosiphon* N.E.Br. ; *Chasmanthe* N.E.Br. ; *Anomalesia* N.E.Br.)

*Perianth-tube* curved, contracted below into a slender basal part, with or without a short spur or sac ; lobes unequal ; upper lobe much longer than the other five, spathulate, concave or hooded. *Stamens* nearly as long as and seated under the upper lobe, arising from the same or different levels on the perianth-tube. *Capsule* ellipsoid, shorter than the bracts, sometimes angular and winged. *Seeds* many, flat, broadly winged.

Corm small, globose or sub-globose, sometimes producing stolons that end in a corm ; leaves basal or cauline, linear or ensiform ; stem simple or branched ; spikes solitary or sometimes up to four ; flowers 3–25 in a spike ; bracts firm or somewhat herbaceous, equal or unequal.

An African genus of 23 species ; 16 species occur in South Africa extending from South West Africa through the coastal belt to the Kentani district.

(Type :—*P. abbreviatus* N.E.Br. = *Antholyza quadrangularis* Bkr. non Burm.)

The above rearrangement of the genera necessitates certain name changes which are given below :—

- Petamenes cunonia** (L.) Phill. = *Antholyza cunonia* L.  
= *Anomalesia cunonia* (L.) N.E.Br.
- P. splendens** (Sweet) Phill. = *Anisanthus splendens* Sweet  
= *Anomalesia splendens* (Sweet) N.E.Br.
- P. saccatus** (Klatt) Phill. = *Anisanthus saccatus* Klatt  
= *Kentrosiphon saccatus* (Klatt) N.E.Br.
- P. Steingroveri** (Pax) Phill. = *Antholyza Steingroveri* Pax  
= *Kentrosiphon Steingroveri* (Pax) N.E.Br.
- P. propinquus** (N.E.Br.) Phill. = *Kentrosiphon propinquus* N.E.Br.
- P. gracilis** (N.E.Br.) Phill. = *Kentrosiphon gracilis* N.E.Br.
- P. Duftii** (Schinz) Phill. = *Antholyza Duftii* Schinz  
= *Kentrosiphon Duftii* (Schinz) N.E.Br.
- P. caffra** (Bkr.) Phill. = *Antholyza caffra* Bkr. non Ker  
= *Chasmanthe caffra* (Bkr.) N.E. Br.
- P. bicolor** (Gasp.) Phill. = *Antholyza bicolor* Gasp.  
= *Chasmanthe bicolor* (Gasp.) N.R.Br.
- P. intermedia** (Bkr.) Phill. = *Antholyza intermedia* Bkr.  
= *Chasmanthe intermedia* (Bkr.) N.E.Br.
- P. aethiopica** (L.) Phill. = *Antholyza aethiopica* L.  
= *Chasmanthe aethiopica* (L.) N.E.Br.
- P. Peglerae** (N.E.Br.) Phill. = *Chasmanthe Peglerae* N.E.Br.,
- P. floribunda** (Salisb.) Phill. = *Antholyza floribunda* Salisb.  
= *Chasmanthe floribunda* (Salisb.) N.E.Br.
- P. fucata** (Herb.) Phill. = *Tritonia fucata* Herb.  
= *Chasmanthe fucata* (Herb.) N.E.Br.
- P. vittigera** (Salisb.) Phill. = *Antholyza vittigera* Salisb.  
= *Chasmanthe vittigera* (Salisb.) N.E.Br.
- P. spectabilis** (Schinz) Phill. = *Antholyza spectabilis* Schinz  
= *Chasmanthe spectabilis* (Schinz) N.E.Br.

The plant named *Petamenes Guthriei* by N. E. Brown is a species of *Homoglossum* and the new combination is **Homoglossum Guthriei** (Bolus) Phill.



## JOSEPH BURTT DAVY.

By M. D. Gunn.

Joseph Burtt Davy, M.A. (Oxon.), Dr. Phil. (Oxon.), Ph.D. (Cantab.), F.R.G.S., F.L.S., whose death occurred at Oxford on the 20th August, 1940, was born on the 17th March, 1870, at Findern in Derbyshire. His name will always be associated with the foundation of the Transvaal Colonial Herbarium that has since developed into the present National Herbarium.

During the year 1891-92 Burtt Davy was an assistant in the office of the Director of the Royal Botanic Gardens, Kew, but resigned owing to ill-health and went to California. He worked at Berkeley University as a research student and held various botanical posts. For a short period he was assistant curator in the U.S. Department of Agriculture at Washington, D.C. During his stay in the States, Burtt Davy wrote several papers on the vegetation of various parts of the country. These included "The Stock Ranges of North-western California", "The Native Vegetation and Crops of the Colorado Delta in the Salton Basin". He wrote the section on the *Gramineae* for Jepson's "Flora of the Western Middle California".

His connection with South Africa began in May, 1903, when he was appointed Agrostologist and Botanist in the newly formed Transvaal Department of Agriculture. Under the South African Republic there was no Department of Agriculture, nor, with the exception of a few agricultural societies, was there any agricultural organization whatever, so that the establishment of a Department of Agriculture represented an entirely new venture in the history of the agriculture of the Colony. In his first annual report he records having placed over 3,300 species in the newly formed Herbarium during his year. Burtt Davy was very interested in the subject of plant introduction and devoted much time to the introduction of seed and plants from various parts of the world. These were tested out at the various experiment stations. An outstanding success was the introduction of teff as a forage crop. His interest in plants was wide and many of his publications deal with various branches of botany.

In 1905, His Excellency the Lieutenant-Governor appointed Burtt Davy an expert member of the Committee of the Transvaal Museum and Zoological Gardens to assist in the development of the Herbarium in the Museum and to help with the laying out and planting of the Zoological Gardens.

In 1907 he took charge of the South African Productions Exhibition in London, and while overseas took the opportunity of visiting southern Europe and northern Africa to study methods of growing certain warm temperate crops and also to obtain seed of crops that he considered particularly adaptable to Transvaal conditions. He also paid a visit to America to study methods of plant breeding with particular reference to maize. While in England he spent some time at the herbarium of the Royal Botanic Gardens at Kew, studying the types and naming specimens of Transvaal trees. This resulted in the publication of his "Geographical Distribution of the Native Trees of the Transvaal". He gave an illustrated lecture on "The Agricultural and Pastoral possibilities of the Transvaal" at the Royal Colonial Institute. This lecture was published in the proceedings of the Society.

In 1908 he was instrumental in establishing a large maize breeding station at Vereeniging. His interest in maize resulted in a comprehensive work published in 1913 under the title "Maize, its History, Cultivation, Handling and Uses", which remained until recently the standard work in South Africa on this subject.

At the time of Union, the Transvaal was the only province that had an organised Division of Botany, and Burt Davy, as its Chief continued to hold office as Government Agrostologist and Chief of the Union's Division of Botany. He resigned this post in 1913 in order to engage in the breeding of farm seeds on his own account at Vereeniging.

After the last war he left South Africa for England and settled at Kew where he began his work on "The Flora of the Transvaal and Swaziland". Two volumes of this work have already been published and his loss will be felt the more by South African botanists as this work at the time of his death was still uncompleted. In 1925 he was appointed Lecturer in Tropical Forest Botany at the Imperial Forestry Institute, Oxford and retained the post up to his death.

During the tenure of his lectureship he was responsible for the training of many students who later filled forestry posts in the Colonial Service. With the help of these students he built up a large forestry herbarium at Oxford, comprising material from all over the British Empire. While at Oxford he was one of the co-editors of a series of publications entitled "The Forest Trees and Timbers of the British Empire", of which the following are of particular interest to South African botanists and foresters:—

Some East African *Coniferae* and *Leguminosae*.

Fifteen South African High Forest Trees.

Fifteen Uganda Timbers.

Burt Davy visited the Union in 1929 as a delegate of the Forestry Section of the British Association for the Advancement of Science. On this occasion he took the opportunity by personal collection of enriching still further the Forest Herbarium at Oxford.

No account of Burt Davy's career would be complete without a reference to his wife, Mrs. Alice Burt Davy. This able and gifted American woman whom he married in California, illustrated many of his contributions and reports on botany.

Burt Davy was a Council Member of the South African Association for the Advancement of Science as far back as 1908; he was elected a Member of the Linnean Society in 1903, a Fellow of the Royal Society of South Africa in 1905, and a Fellow of the Royal Geographical Society.

Dr. Burt Davy has without doubt left his mark on South African botany and agriculture, and during his residence in the country gave loyal and devoted service. A former Secretary for Agriculture in one of his annual reports, wrote:

"During the time he was in the Government Service, Mr. Burt Davy performed an immense amount of most valuable scientific and educational work, and the services he rendered the country, particularly in connection with the popularisation of teff grass, and the assistance and impetus he gave to mealie growing, will always be regarded as landmarks in the history of South African agriculture".

## SOME SOUTH AFRICAN VALSACEAE.

By Ethel M. Doidge.

Very little is known of fungi, on South African hosts, belonging to the genus *Diatrype* and related genera, except for a small number of species collected in the later years of the 19th century by MacOwan and Medley Wood; most of these were named and described by Kalchbrenner and Cooke (6).

Part of the type collections of some of these fungi is to be found in the Cryptogamic Herbarium at Pretoria or in the South African Museum in Cape Town. The type material of other species appears to consist of small fragments in the Kew Herbarium or in the Berlin Herbarium.

As opportunity offered, a search has been made for fresh material of MacOwan's fungi and those of Medley Wood; in one or two cases the search was successful, and amongst the specimens examined there were a number of species apparently undescribed. Some of these were recently described by Sydow (8) and further species are described in the present paper, in which are included descriptions of all fungi of this group recorded from South Africa.

Some of the type collections made by MacOwan and Medley Wood are in excellent condition, but others are fragmentary and confused, more than a single fungus being included under a single collector's number. A careful study has been made of the material available, and it has been possible in most cases to write a detailed description of the older species. Berlese's drawings (1) have proved very helpful, and three of them are reproduced. I am indebted to the Director of the Imperial Mycological Institute for photographs of the original plates.

During recent years a number of workers, including von Höhnelt, Sydow, Theissen, Petrak and others, have studied the morphology and taxonomy of the stromatic Sphaeriales. Several systems of classification have been proposed, based in some cases on the imperfect forms associated with the ascus stage. In particular may be mentioned von Höhnelt's classification of the Allantosphaeriaceae and Diaportheae (9) and the cultural studies of Wehmeyer (10).

Except in the case of parasites of cultivated plants, some of which occur only in the conidial stage in South Africa, information is lacking with regard to the imperfect forms of the South African species. There has been no opportunity for making cultural studies, and no conidial forms have been found occurring naturally in association with the ascus forms. In this preliminary study, therefore, no attempt could be made at a natural classification and an artificial key to the genera is given. The genera included are those classified in the family Valsaceae in Volume XXIV of Saccardo's *Sylloge Fungorum*.

I am indebted to Miss E. M. Wakefield, to Mr. E. W. Mason and to Dr. H. Sydow for help and advice in connection with some of the species, and to Mr. A. H. V. King for the excellent photographs illustrating the paper.

A note seems necessary about the interpretation of the term "ostiole"; there seems to be no general agreement among mycologists as to the definition of this term. In the recent description published by Sydow, it is applied to the whole papilla or neck of the perithecium, and it is used in that sense in this paper.



## VALSACEAE.

## KEY TO GENERA RECORDED FROM SOUTH AFRICA.

## A.—Spores allantoid, hyaline or sub-hyaline.

## (a) Perithecia caespitose, without distinct stroma.

1. Perithecia beaked..... *Calosphaeria*.  
 2. Perithecia not beaked..... *Erostella*.

## (b) Perithecia in a stroma.

1. Asci with tapering, persistent stalks, forming a definite, persistent layer ; ostioles sulcate.  
 (aa) Stroma formed from the changed matrix, asci 8-spored..... *Eutypella*.  
 (bb) Stroma different from the matrix.  
   (i) Asci 8-spored..... *Diatrype*.  
   (ii) Asci many-spored..... *Diatrypella*.  
 2. Asci with evanescent stalks, soluble in water, often almost filling the perithecial cavity,  
 (aa) Ostioles fasciculate, long, protruding, entire or sulcate..... *Peroneutypella*.  
 (bb) Ostioles converging, not protruding or slightly so, entire..... *Valsa*.

B.—Spores 1-celled, hyaline, not allantoid, stroma valsiform, perithecia circinate..... *Cryptosporella*.C.—Spores hyaline, 1-septate..... *Diaporthe*.

## D.—Spores brown, 1-septate.

- (a) Stroma phyllogenuous..... *Pseudothia*.  
 (b) Stroma not phyllogenuous..... *Valsaria*.

## E.—Spores hyaline, 2- or more-septate.

- (a) Stroma superficial..... *Holstiella*.  
 (b) Stroma immersed..... *Calospora*.

## CALOSPHERIA Tul.

Select. Fung. Carp. (1861–1865).

Stroma none, perithecia free or seated on the inner bark, scattered, or more frequently collected in more or less distinctly circinate groups. Ostioles more or less elongated. Asci clavate, generally racemose-fasciculate, sessile or stipitate, 8-spored. Paraphyses usually much longer than the asci, stout, evanescent. Spores allantoid.

*Calosphaeria princeps* Tul.

Sel. Fung. Carp. II. p. 109 ; Sacc. Syll. Fung. I. p. 95 ; Ellis and Everhart, North. Amer. Pyren. (1892) p. 507.

## Plate I.

Stroma none. Perithecia lying on the surface of the inner bark, and attached to it in groups which are round to elliptic in outline, scattered and mostly up to 5 mm. diam.

Perithecia densely crowded, black, smooth, shining, globose, circinate, 450–600 $\mu$  diam., narrowing suddenly above into the ostioles. Ostioles prolonged into long necks, which are centripetal, converging towards a crack in the outer bark which is slightly raised, very long.

flexuous, cylindrical, about  $150\mu$  thick; becoming fasciculate, ascending and finally erect near the apex in the centre of the group. Perithecial wall blackish-brown, sub-opaque, firm, membranous,  $30-50\mu$  thick, composed of roundish-angular, rather thin-walled cells  $4-7.5\mu$  diam.; at the point of attachment to the inner bark, the wall is continuous with a short foot of smaller-celled tissue (cells  $2-2.5\mu$  diam.) which penetrates into the tissue of the host, and resolves itself into light brown, tortuous, branching hyphae  $2-2.5\mu$  thick, which penetrate more deeply into the host tissues.

Asci very numerous, 8-spored, clavate, rounded above, tapering below into a slender hyaline stalk, sp. part  $18-26 \times 3.5-5\mu$ . Paraphyses very numerous, simple, hyaline, rather thick, far exceeding the asci. Spores loosely conglobate, hyaline, allantoid, rounded at the ends,  $4-6 \times 1.25-1.5\mu$ .

on *Prunus armeniaca* L., on dead branches, Swinburne near Harrismith, Petty, 2237; Dundee, Doidge, 15499.

*Prunus persica* Stokes, Marianthall, Ixopo, Pole Evans, 5609; Parys, Town Clerk, 14107.

### **Erostella** (Sacc.) Trav.

Fl. ital. Crypt. Fung. Pyren. fasc. I (1906) p. 155.

Syn. *Togninia* Berl. Icon. Fung. III (1900) p. 9.

*Calosphaeria*, sub-gen. *Erostella* Sacc. Syll. Fung. I (1882) p. 101.

Like *Calosphaeria*, but perithecia not beaked.

### **Erostella quaternarioides** (Berl.) Sacc.

Syll. Fung. XXII (1913) p. 353.

Syn. *Togninia quaternarioides* Berl. Icones Fung. III (1900) Tab. XIV fig. 1.

Plate 4 a.

Perithecia developed in the cortex, in valsiform acervulae, in groups of 4-5, covered by the raised periderm, ovoid, or, not infrequently, angular through compression, black,  $500\mu$  diam., constricted above into a thick ostiole traversed by a pore.

Asci clavulate,  $30-40 \times 6-7\mu$ , tapering below into a long, slender stalk. Spores allantoid, pale greenish yellow,  $8-12 \times 3-4\mu$ .

on branches, South Africa; associated with *Peroneutypella cylindrica* (Kalch. et Cke.) Berl.

8

This fungus was not detected on the type material of *P. cylindrica* in Kew Herbarium nor was it found in recent collections of this fungus. The above description is after Berlese and his drawing is reproduced.

### **Eutypella** Nits. (ut sub-gen.)

Pyren. Germ. 2 (1870) p. 163; Sacc. Consp. Gen. Pyr. (1876) p. 4.

Stroma usually well developed, effuse or isolated, bounded by a dark marginal zone, formed from fungus hyphae permeating the host tissues which are more or less altered. Perithecia usually erumpent in groups; ostioles not protruding or slightly so, sulcate. Asci 8-spored. Spores allantoid, 1-celled, yellowish to brownish.

## KEY TO SPECIES.

- A.—Stroma effuse, spores  $8-15 \times 2-2.5 \mu$ ..... *Eu. Acaciae*.
- B.—Stroma limited.
- (a) Ostioles  $400 \mu$  long or more, usually longer than the perithecia.
1. Spores  $5-6.5 \times 1 \mu$ , on *Lycium*..... *Eu. Lycii*.
  2. Spores  $4-9 \times 1.5-2 \mu$ .
    - (i) on deciduous trees..... *Eu. stellulata*.
    - (ii) on *Citrus*..... *Eu. citricola*.
- (b) Ostioles up to  $350 \mu$  long, usually shorter than the perithecia.
- (i) Perithecia  $500-700 \mu$  diam..... *Eu. MacOwani*.
  - (ii) Perithecia  $200-400 \mu$  diam..... *Eu. Doidgeae*.

**Eutypella Acaciae** Doidge nov. sp.

Plate 6 c.

Stromata widely effuse, developing in the cortex, ca. 2-8 cm. long and up to 2 cm., broad, irregular, the limits being indicated by black lines in the outer layers of the wood; consisting of a pale to dark fungous tissue amongst the cells of the host, which are unaltered or only slightly so.

Perithecia monostichous, scattered or in irregular series, sometimes solitary, but usually in groups of 2-5, rarely up to 8, completely immersed, globose to ovate, occasionally flat-sided through mutual pressure,  $330-550 \mu$  diam.,  $400-529 \mu$  high, narrowing suddenly above into rather thick, cylindrical ostioles. Ostioles more or less convergent, rather closely connate and fused with the tissue of the stroma, seldom single, usually in groups,  $300-350 \mu$  long, protuding slightly but definitely through cracks in the periderm, delicately 3-5-sulcate, traversed by a pore which is lined with copious fine, hyaline, spreading periphyses. Perithecial wall firm, membranous, blackish-brown, composed of several layers of compressed cells, about  $20 \mu$  thick at the base and sides, giving place within to a rather loosely woven, hyaline, filamentous, concentric layer about equal in thickness. Asci very numerous, clavate, 8-spored, sp. part ellipsoid to fusoid, rounded above,  $35-40 \times 6-6.5 \mu$  tapering below into a long slender stalk. Spores distichous to tristichous, pale olivaceous, allantoid, continuous, rounded at the ends, more or less curved, outer wall often semi-circular,  $8-15 \times 2-2.5 \mu$ .

on dead branches of *Acacia ataxacantha* D.C., Kromrivier, Rustenburg Distr., Doidge and Bottomley, 30476.

**Eutypella Lycii** Doidge, nov. sp.

Stromata scattered, or in irregular rows paralld with the axis of the stem, discrete, rather distant from one another, black, carbonaceous, up to  $1.5 \text{ mm.}$  diam., conical truncate on a circular or broadly elliptic base, grossly verrucose at the surface, immersed in the cortex from which the ostioles only are erumpent.

Lower part of the stroma consisting of a hyaline or sub-hyaline, filamentous, more or less closely interwoven fungous tissue, interrupted by the golden yellow, slightly altered remnants of the tissue of the host; becoming more closely interwoven and brown above, where it is traversed by the ostioles, and at the sides, where the periderm of the host is firmly adherent; at the surface, from which the ostioles protude, there is a carbonaceous crust consisting of blackish-brown, opaque, round to angular, parenchymatous cells,  $4-6 \mu$  diam.

Perithecia monostichous, usually 1-7, rarely 8-13 in each stroma, arranged in a circle or somewhat irregularly, globose to ovate, or flat-sided through mutual pressure,  $350-450 \mu$  diam.,  $400-475 \mu$  high, narrowing suddenly above into the ostioles. Ostioles more or less

curved, 500–550  $\mu$  long, convergent, cylindrical below, broadening somewhat towards the apex, which is rather deeply 3–5-sulcate and which protrudes slightly from the stroma; traversed by a narrow funnel-shaped pore, which is about 60  $\mu$  broad at the base and widens upwards and is lined with numerous, fine, hyaline, ascending periphyses. Perithecial wall firm, membranous, about 25  $\mu$  thick, composed of several layers of rather thin-walled, blackish-brown, compressed cells, which give place internally to a concentric, hyaline, filamentous layer of about equal thickness; in the ostioles, the cells are light yellow-brown, translucent, elongated, in more or less regular rows following the course of the ostioles, becoming darker and shorter upwards and terminating in a blackish-brown, opaque tissue similar to that of the stromatic crust. Asci very numerous, 8-spored, clavate, less frequently sub-fusiform, total length 35–40  $\mu$ , rounded above, tapering below into a slender stalk of varying length, sp. part 25–28  $\times$  3.75–5  $\mu$ . Spores distichous, continuous, allantoid, rounded at the ends, more or less curved, rarely almost straight, sub-hyaline, pale olivaceous in mass, 5.6–5  $\times$  1  $\mu$ . Paraphyses not seen.

on branches of *Lycium echinatum* Dun., Aliwal North, Pienaar, 2094.

Spegazzini has described *Eutypella andicola* (Syll. Fung. 24 p. 723) on *Lycium* spp. from the Argentine. No specimen of this species has been available for comparison, but judging from the description, it differs considerably from the fungus described above.

### ***Eutypella MacOwani* Doidge nov. sp.**

Plate 8 a.

Stromata single, scattered irregularly or somewhat crowded over large areas of the branch, usually discrete, rarely becoming confluent, more or less circular in outline, occasionally elliptic, broadly truncate conoid, 1–2 mm. diam., pushing up the periderm into raised pustules which split in more or less stellate fashion; the surface of the stroma becomes more or less erumpent, often remaining partly veiled by the torn periderm.

The lower part of the stroma consists of a filamentous, more or less closely interwoven fungous tissue among the golden yellow to brown elements of the host, which are not altered or only slightly so. At the surface there is a brittle, black, opaque, carbonaceous crust, 45–80  $\mu$  thick, traversed by the ostioles and consisting of blackish-brown, irregularly angular cells 4–6  $\mu$  diam. With age, the outer crust often breaks away, leaving the ostioles and the upper part of the perithecia exposed.

Perithecia monostichous, 3–6, rarely up to 10 in a single stroma, globose or broadly ovate, rarely flat sided through lateral pressure, 500–700  $\mu$  diam., 600–800  $\mu$  high, narrowing suddenly above into thick, cylindrical ostioles. Ostioles 200–300  $\mu$  long, 200–300  $\mu$  thick, usually separately erumpent, not protruding or very slightly so, 3–5-sulcate, traversed by a broad pore which is lined with numerous hyaline periphyses. Perithecial wall rather thick, membranous, blackish-brown, opaque, 20–25  $\mu$  thick, less frequently up to 30  $\mu$  thick, giving place internally to a pale yellowish concentric, filamentous layer 8–10  $\mu$  thick. Asci very numerous, 8-spored, clavate, rounded above, tapering below into a long, slender stalk, sp. part 20–30  $\times$  5–6  $\mu$ . Spores distichous, allantoid, more or less curved, rarely almost straight, sub-hyaline, light yellow brown in mass, 7.5–10  $\times$  1.75–2.5  $\mu$ . Paraphyses not seen.

on branches of unknown tree (? Somerset East), MacOwan 1334b, 22005. In Herb. Kew sub *Diatrype Durieui* Mont. [Grevillea X (1882) p. 146].

According to Ellis and Everhart (3, p. 570) *D. Durieui* is a synonym for *D. albopruinosa*, which is a true *Diatrype* with 10–30 perithecia in a stroma and spores 12–16  $\times$  2.5–4  $\mu$ . MacOwan 1344b differs in external appearance from the type of *Diatrype Durieui* in Kew Herbarium and the host is different; the type is on oak branches from Algeria.

It is difficult to obtain accurate measurements of the asci, as they disintegrate very readily in the old material.



**Eutypella stellulata** Fr. (Sacc.).

Syll. Fung. I (1882) p. 149; Ell. and Ev., North Amer. Pyren. (1892) p. 489; Hopkins, Trans. Rhod. Sc. Ass. 35 (1938) p. 101.

Syn.: *Valsa stellulata* Fr. Summ. Veg. Scand. p. 311; Medley Wood, Rept. Natal Bot. Gdns. (1898) p. 19.

Plate 7 b, c.

Stromata scattered over large areas of the stem, minute, round to elliptic in outline, 1–2 mm. diam., sometimes becoming confluent in small groups, black, carbonaceous, verrucose; developing in the cortex, pushing up the periderm into raised pustules which soon crack irregularly or in stellate fashion; the periderm remains partly veiling the stroma, from which only the groups of black sulcate ostioles are erumpent.

The inner part of the stroma consists of a fungous tissue formed of more or less closely interwoven, sub-hyaline to dark brown hyphae, interrupted by the unaltered or slightly altered cells of the host. At the surface this becomes more closely compacted, and forms an irregular, carbonaceous, opaque, black crust, 20–35  $\mu$  thick, interrupted by the groups of ostioles.

Perithecia usually 2–12 in a single stroma, ovate to oblong, closely crowded, often flat-sided through mutual pressure, 200–375  $\mu$  diam., 500–600  $\mu$  high, narrowing above suddenly or rather gradually into rather long, cylindrical ostioles. Ostioles cylindrical, convergent, fasciculate, 400–700  $\mu$  long, erumpent in groups, connate—at least below—protruding up to 500  $\mu$  from the stroma, traversed by an irregular pore, 15–25  $\mu$  diam., which is rather sparsely lined with short, hyaline periphyces. Perithecial wall firm, membranous, opaque, blackish-brown, 20–30  $\mu$  thick, formed of several layers of compressed, angular, dark brown cells ca. 4–5  $\mu$  diam.; giving place internally to a sub-hyaline, concentric, filamentous layer ca. 10  $\mu$  thick. Asci numerous, 8-spored, clavate, rounded above, tapering below into a long, slender stalk, sp. part 35–50  $\times$  5–6  $\mu$ . Spores distichous, allantoid, tapering somewhat to rounded ends, slightly curved, rarely almost straight, sub-hyaline, light yellowish brown in mass, 4–8  $\times$  1.5–2  $\mu$ , rarely up to 11  $\times$  2  $\mu$ .

on dry sticks, Inanda, *Medley Wood* 574, 9493, 11109.

on branch of *Pyrus malus* L., Concession, S. Rhodesia, *Hopkins* 3646.

This fungus seems to agree well with *Eu. stellulata*, which occurs commonly on limbs of deciduous trees in the United States and in Europe. The spore measurements agree with those given by Ellis and Everhart (loc. cit.) rather than with those in Saccardo's description. I am indebted to Dr. J. C. Hopkins for a portion of his material of *Eu. stellulata* on *Pyrus*.

**Eutypella citricola** Syd.

Hedwigia XLIX (1909) p. 80; Sacc. Syll. Fung. XXII, p. 357.

Plate 7 d, e.

Stromata crowded, round to elliptic in outline, 0.75–2 mm. diam., black, pulvinate, often becoming confluent and fused into larger, compound bodies; developing in the cortex and pushing up the periderm, which becomes raised, pustuliform and finally raptures irregularly, exposing the 3–5-sulcate ostioles. The stroma remains veiled by torn fragments of the periderm.

The lower part of the stroma consists of a pale to dark brown fungous tissue, formed of more or less closely interwoven hyphae, 3–4  $\mu$  thick, interrupted by the slightly altered or unaltered cells of the host. This becomes more firmly compacted above and at the sides, forming a blackish-brown, opaque, carbonaceous crust, 50–75  $\mu$  thick.

Perithecia monostichous, 6–12 in a single stroma, ovate to oblong, closely crowded and usually flat-sided through lateral pressure, 250–400  $\mu$  diam., 550–600  $\mu$  high, narrowing suddenly, or rather gradually above into the cylindrical ostioles. Ostioles fasciculate, connate, 400–450  $\mu$  long, erumpent in groups and protruding 200–400  $\mu$  from the stroma; usually ca 200  $\mu$  broad; Traversed by a pore 40–60  $\mu$  broad lined with numerous,

hyaline periphyse. Perithecial wall firm, membranous, blackish-brown, sub-opaque, 15–25  $\mu$  thick; composed of several layers of closely interwoven, rather thin-walled hyphae 3–4  $\mu$  thick, giving place rather gradually within to a hyaline or sub-hyaline, filamentous, concentric layer about half its thickness. Asci 8-spored, very numerous, clavate, rounded above, tapering below into a long, slender stalk, sp. part ellipsoid to clavate, 30–40  $\times$  4–5  $\mu$ . Spores distichous, allantoid, broadly rounded at the ends, slightly curved, rarely almost straight, fuscous, yellow brown in massa, 6–9  $\times$  1.75–2  $\mu$ .

on dead wood of *Citrus sinensis* Osbeck, Maritzburg, Natal, Ackerman (Rump 150) 28468a.

Compared with a specimen from the Philippines identified by Rehm (Baker's Fungi Malayana 137). The South African fungus agrees very well with this collection.

### **Eutypella Doidgeae Syd.**

Ann. Myc. 37 (1939) 189–190.

Plate 8 b, c.

Stromata single, scattered irregularly; or in irregular groups of varying size, and then often closely crowded, and not infrequently confluent or fused in groups of two or more; more or less circular in outline, broadly truncate-conoid, 0.5–1.5 mm. diam., pushing up the periderm into raised pustules, which split irregularly or in stellate fashion; usually only the groups of ostioles are erumpent.

The lower part of the stroma consists of a filamentous, small-celled, more or less closely woven fungous tissue, interrupted by vestiges of the substratum, which are not altered or only slightly; above there is a rather brittle, carbonaceous crust, traversed by the ostioles, and consisting of an almost opaque, blackish-brown, parenchymatous tissue of irregularly angular, rather thick-walled cells, 4–8  $\mu$  diam.

Perithecia monostichous, usually 2–6, seldom more, completely immersed in the stroma, globose or broadly ovate, often flat-sided through lateral pressure, 200–400  $\mu$  diam., 400–500  $\mu$  high, narrowing suddenly above into the thick, cylindrical ostioles; ostioles somewhat elongated, usually definitely protruding, 150–200  $\mu$  thick, up to 350  $\mu$  long, seldom single, usually erumpent in groups and rather closely connate below, delicately or rather deeply 3–5-sulcate. Perithecial wall rather thick, membranous, mostly about 20  $\mu$  thick, composed of closely compressed, rather thick-walled, translucent, blackish-brown cells, which give place internally to a hyaline, concentric, filamentous layer of about equal thickness. Asci very numerous, 8-spored, clavate, less frequently sub-fusiform, broadly rounded above, tapering gradually downwards into a stalk which varies in length, sp. part 28–45  $\times$  5–7  $\mu$ . Spores distichous or imperfectly tristichous, obtusely rounded at the ends not tapering or very slightly so, weakly allantoid, seldom straight, 1-celled, light yellow-brown, rather dark reddish brown in mass, 7–10.5  $\times$  2–2.5  $\mu$ . Paraphyses comparatively numerous, but early collapsing and becoming unrecognisable.

on dead branches of *Halleria lucida* L., Trigaartspoort, Pretoria distr., Doidge and Bottomley, 30378; Boschfontein, Rustenburg distr., Doidge and Bottomley, 30897.

### **Diatrype Fr. emend. Wehm.**

Amer. Jour. Bot. XIII (1926) p. 637.

Stroma usually well developed, effuse or isolated. Ectostroma strongly developed and deciduous. Entostroma forming a widely erumpent disk, dark marginal zone present. Perithecia immersed in the stroma, ostioles parallel or scarcely converging, sulcate. Asci 8-spored, with more or less elongated, persistent stalks, resulting in a definite, persistent layer of ascilining the walls of the perithecium. Ascospores allantoid, 1-celled, yellowish-hyaline.

## KEY TO SOUTH AFRICAN SPECIES.

A.—Ostioles long, protruding 200–250  $\mu$  from the stroma.

- (a) Ostioles 300–400  $\mu$  long; spores  $6-8 \times 1.75-2 \mu$ ..... *D. Doryalidis*.  
 (b) Ostioles 450–550  $\mu$  long; Spores  $6-10 \times 2-2.5 \mu$ ..... *D. xumenensis*.

B.—Ostioles 150–300  $\mu$  long, protruding slightly; spores  $10-15 \times 2.5-3 \mu$ ..... *D. conferta*.

C.—Ostioles comparatively short, not protruding or barely so.

- (a) Inner stroma yellow to orange..... *D. auristroma*.  
 (b) Inner stroma sub-hyaline to brown.  
 (1) Perithecia 300–600  $\mu$  diam.; spores  $7-11.5 \times 1.75-2.5 \mu$ ..... *D. caulina*.  
 (2) Perithecia 180–300  $\mu$  diam.; spores  $7.5-10 \times 2-2.75 \mu$ ..... *D. MacOwaniana*  
 (3) Perithecia 300–400  $\mu$  diam.; spores  $10-12.5 \times 2-2.5 \mu$ ..... *D. Leonotidis*.  
 (4) Perithecia 300–450  $\mu$  diam.; spores  $10-15 \times 2.5-3 \mu$ ..... *D. caminata*.

**Diatrype Doryalidis** Doidge, nov. sp.

Plate 9 a.

Stromata at first scattered, then more or less closely crowded in groups of varying size; immersed in the cortex and pushing up the periderm into raised pustules, which finally rupture irregularly or instellate fashion, exposing the deeply 3–5-sulcate ostioles; the stroma remains partly veiled by the closely adhering periderm. Stromata small, round to elliptic, 0.5–1 mm. diam., discrete, or confluent in groups of 2–3 or more and becoming fused.

The ground tissue of the stroma is hyaline to light yellowish brown, without definitely recognisable structure; at the surface and sides, this gives place to a dark brown, sub-opaque outer crust, 30–75  $\mu$  thick, composed of golden brown to dark brown, round to angular cells 2.5–5  $\mu$  diam.; at the sides it forms a line of demarcation between individual stromata; on the surface it is partly veiled by torn remnants of the periderm, which adhere to it.

Perithecia 2–6 in a single stroma, arranged in a circle or line, ovate to oblong, often flat-sided through mutual pressure, 300–450  $\mu$  diam., 450–500  $\mu$  high; narrowed suddenly or rather gradually above into long, cylindrical ostioles. Ostioles parallel or converging slightly, traversing the outer crust of the stroma and fused with it, 300–400  $\mu$  long, of which ca. 250  $\mu$  protrudes from the stroma, broadening somewhat at the sulcate apex which is 200–250  $\mu$  diam.; traversed by a pore ca. 100  $\mu$  diam. and lined with numerous, fine hyaline periphyses. Perithecial wall firm, membranous, dark brown, sub-opaque, 20–35  $\mu$  thick, composed of golden brown to blackish-brown, thin-walled, angular cells 2.5–5  $\mu$  diam.; giving place gradually within to a sub-hyaline, concentric, filamentous layer of about equal thickness. Asci very numerous, 8-spored, clavate, rounded above, tapering below into a very long, slender, hyaline stalk,  $30-40 \times 5-6 \mu$ . Spores distichous, allantoid, sub-hyaline, yellow brown in mass, rounded at the ends, not tapering, more or less curved, rarely almost straight,  $6-8 \times 1.75-2 \mu$ .

on stems of *Doryalis rhamnoides* (Burch.) Harv., Knysna, Bottomley, 231060.

**Diatrype xumenensis** Doidge, nov. sp.

Plates 2 b. and 9 b.

Stromata scattered widely and irregularly, sometimes quite discrete, but usually more or less closely massed together and forming parallel rows or series of varying length, following the direction of the fibres of the host; at first covered, erumpent only at the apex through irregular fissures in the periderm; finally becoming more or less free, but still covered by adhering shreds of the tissues of the host. Stromata round or elliptic in outline, verrucose or pulvinate, about 1 mm. diam.; when closely crowded, becoming more or less completely fused, and forming compound, linear stromata up to 1 cm. long; these often occur in closely crowded groups, and finally form larger stromatal cushions up to 3 cm. long and 5 mm. wide.



Outer crust of the stroma carbonaceous, rather brittle when old, consisting of round or angular, thick-walled, translucent, blackish-brown cells about  $5-8\ \mu$  diam. : ground tissue light to dark brown, at the sides composed of cells elongated in a vertical direction ; structure between the perithecia not readily recognisable.

Perithecia completely immersed in the stroma, 2-8 in each individual stroma, arranged more or less in a circle or in a row, monostichous, closely crowded, becoming more or less flat-sided and irregular through lateral pressure,  $200-450\ \mu$  diam.,  $450-550\ \mu$  high, often somewhat flattened at the base, where they are seated on the woody elements of the host ; narrowing suddenly or rather gradually above into the cylindrical ostioles. Ostioles parallel or somewhat convergent, connate below and fused to the stromatal crust,  $450-550\ \mu$  long, protruding ca.  $200\ \mu$  from the stroma,  $150-300\ \mu$  thick, entire or delicately sulcate, traversed by a pore  $70-90\ \mu$  broad and lined with fine hyaline periphyses. Perithecial wall firm membranous, variable in thickness, mostly  $16-25\ \mu$  thick at the base and sides, composed of several layers of blackish-brown, compressed, sub-opaque cells, becoming paler and less definite in structure internally and gradually giving place to a hyaline, filamentous, concentric layer. Asci very numerous, 8-spored, clavate, sp. part ellipsoid or somewhat fusoid,  $40-45 \times 5.5-6.5\ \mu$ , rounded above, tapering below into a long, slender stalk. Spores distichous or imperfectly tristichous, cylindrical, rounded at the ends, allantoid, more or less curved, sub-hyaline, light yellow-brown in mass,  $6-10 \times 2-2.5\ \mu$ .

on dead branches, Xumeni Forest near Donnybrook, *Morgan and Doidge*, 28919.

***Diatrype auristroma* Doidge nov. sp.**

Plates 2 a and 11 a, b.

Stromata usually in groups, less frequently more or less scattered : at first immersed in the cortex with only the black-shining ostioles visible ; finally becoming more or less free. The bark breaks away, leaving the stromata exposed, but with shreds of the host tissues adhering to them and partly veiling the surface. Stromata round to elliptic, or elongated in the direction of the fibres of the host, 1-6 mm. long, 1-1.5 mm. broad, pulvinate, up to 1.5 mm. high ; usually crowded together in groups up to ca. 2 cm. long and 5 mm. broad.

Stroma seated on the wood or the inner layers of the cortex, attached all along the base, or base more or less contracted ; in the latter case the basal part is sterile and is traversed by remnants of the host tissues ; the ground tissue between the perithecia consists of cells elongated in a vertical direction. The stroma is bounded by a dark brown layer,  $12-15\ \mu$  thick, composed of small parenchymatous cells  $3-5\ \mu$  diam. ; this is sharply defined at the sides, but at the upper surface, where it is interrupted by the ostioles of the perithecia, it goes over gradually into the ground tissue of the stroma. The ground tissue is golden to orange brown (in Ridgway, Colour Standards and Nomenclature, raw siena shading in places, especially at the base to xanthine orange) ; the outer stromatal crust often becomes brittle with age and breaks away, revealing the yellow inner stroma.

Perithecia 5-30, closely crowded, monostichous or sub-distichous (the latter more frequent in stromata with contracted base), ovate, oblong or irregular in shape through mutual pressure,  $450-900\ \mu$  high,  $220-450\ \mu$  diam. ; narrowing above, suddenly or rather gradually into a very short, thick ostiole. Ostioles usually broadly funnel-shaped, less frequently cylindrical,  $120-180\ \mu$  long, barely protruding,  $100-150\ \mu$  broad at the base and broadening upwards to about  $200\ \mu$  at the 3-5-sulcate apex ; traversed by a broad pore, lined with numerous hyaline periphyses. Perithecial wall equal in thickness throughout, even in the ostioles,  $10-12\ \mu$  thick, dark brown, sub-opaque, composed of several layers of thin-walled, slightly compressed, parenchymatous cells ca.  $10-12\ \mu$  diam., giving place suddenly within to a pale golden layer of equal thickness. Asci very numerous, 8-spored, clavate, rounded and somewhat thickened at the apex, sp. part  $30-36 \times 5-6\ \mu$ , tapering below into a very long, slender stalk. Spores distichous, sub-hyaline or yellowish, olive ochre in mass, allantoid, curved, rarely almost straight, rounded at the ends, not tapering  $6-8.5 \times 1.5-1.75\ \mu$ .



on dead branches of *Xymalos monospora* Baill., Marwaqa Forest, near Bulwer, *Morgan* and *Doidge*, 31073; Xumeni Forest, near Donnybrook, *Morgan* and *Doidge*, 28929.

on dead branches of *Minusops Zeyheri* Sond., Boschfontein, Rustenburg Distr., *Doidge* and *Bottomley*, 30171.

### ***Diatrype caulina* Syd.**

Ann. Myc. 37 (1939) pp. 184-186.

Plates 3 b and 9 c.

Stromata in dark spots on the stems, rarely solitary, usually more or less crowded in groups of two or more; these groups are usually irregular, but elongated in the direction of the stem axis, often combining to form irregularly undulating stromatal ribbons of varying breadth. Stromata round to broadly elliptic in outline, rather strongly convex, verrucose or pulvinate, folded or grooved at the surface, 0.7-1.5 mm. diam., or up to 2 mm. long and 1-1.5 mm. broad; sometimes they are placed in short parallel rows, become confluent and fused and form larger compound stromata.

Outer crust of stroma brittle, carbonaceous, 25-80  $\mu$  thick, parenthymatous in structure, composed of cells which are almost opaque, blackish-brown, rather thick-walled, irregularly angular, 6-14  $\mu$  diam. The ground tissue between the perithecia is almost hyaline, without definitely recognisable structure.

Perithecia few, usually 1-6 in a single stroma, monostichous, rather distant from one another, hence globose, rarely flattened by lateral pressure, 300-600  $\mu$  diam., seldom somewhat larger. Ostioles rather short, broadly cylindrical, not protruding from the stroma or very slightly so, entire or very delicately sulcate, traversed by a pore ca. 50-70  $\mu$  broad and lined with copious, hyaline, short, spreading periphyses. Perithecial wall membranous, becoming brittle with age, of varying thickness, usually 20-30  $\mu$  thick, composed of more or less numerous layers of strongly compressed cells; these are translucent, blackish-brown, irregularly angular, up to 15  $\mu$  diam., giving place suddenly within to a sub-hyaline, concentric, filamentous layer. Asci very numerous, clavate or sub-fusiform, broadly rounded above, tapering gradually below into a rather long, delicate stalk, sp. part 26-38  $\times$  4.5-6.2  $\mu$ . Spores distichous or incompletely tristichous, cylindrical, rounded at both ends, allantoid, only slightly curved, seldom almost straight, continuous sub-hyaline, light yellowish-brown in mass, 7-11.5  $\times$  1.7-2.5  $\mu$ . Paraphyses rather numerous, but breaking down early and becoming unrecognisable.

on dead stems of *Asparagus* sp., Dooley, near Mont-aux-Sources, *Doidge*, 13792.

### ***Diatrype MacOwaniana* Thüm.**

Fungi austro-africani V No. 117, in Flora (1877) p. 4; Sacc. Syll. Fung. I. p. 196.

Syn: *Diatrype capensis* Kalch. et Cke. (not as figured by Berlese) Grevillea IX (1880) p. 28; Sacc. Syll. Fung. I. p. 195.;

*Diatrype Bona-spei* Berl. Icon. Fung. III (1900) p. 87<sup>1</sup>; t. 106, f. 2; Sacc. Syll. Fung. XVII (1905) p. 571; "in herb. Berol. sub nomine err. '*Diatrype capensis*'".

Plate 10.

Stromata scattered over the surface of the stem, often numerous, more or less crowded and becoming coalescent in small groups of 2-3, round to irregular in outline, minute, rarely exceeding 1 mm. in diam., sometimes up to 1.5 mm.; at first completely immersed in the cortex, pushing up the periderm into raised pustules; the periderm finally ruptures, remaining adherent to the sides of the stroma, but exposing its black, pulvinate or somewhat verrucose surface.

Outer crust of stroma rather brittle, opaque, brownish-black, carbonaceous; ground tissue between the perithecia sub-hyaline to pale yellowish-brown and without recognisable structure.

Perithecia 2-8 in a single stroma, arranged in a circle or more or less irregularly, monostichous, sub-globose to ovate, often becoming ellipsoid to oblong through mutual lateral pressure, 180-300  $\mu$  diam., 300-400  $\mu$  high, narrowing suddenly above into rather short, thick, cylindrical ostioles. Ostioles parallel or somewhat convergent, 150-200  $\mu$  long, not protruding from the stroma or very slightly so, fused at the apex with the black outer crust of the stroma; traversed by a pore 50-60  $\mu$  diam., which is lined with numerous, fine, hyaline periphyses. Perithecial wall firm, dark brown, sub-opaque, about 10  $\mu$  thick. Asci numerous, lining the perithecial cavity, clavate, 8-spored, sp. part 35-40  $\times$  5-6.5  $\mu$ , tapering below into a long, slender stalk. Spores distichous or imperfectly tristichous, very pale, olivaceous, light yellow brown in mass, continuous, allantoid, rounded at the ends, only very slightly curved, 7.5-10  $\times$  2-27.5  $\mu$ .

on stems of *Cassinopsis capensis* Sond., Boschberg, Somerset East, MacOwan 1264, 20951a.

*Diatrype MacOwaniana* was described by von Thümen (loc. cit.) in 1876; the type collection was MacOwan 1264, the host being given as *Cassine capensis*. It seems evident that a clerical error was made in transcribing the name of the host, which is *Cassinopsis capensis* Sond. *Cassine capensis* L. is a shrub limited to the south-western Cape, and it is unlikely that it would be found growing in the Boschberg, near Somerset East.

In Grevillea X (1882) the same collection, MacOwan 1264, was quoted by Kalchbrenner and Cooke as the type of *Diatrype capensis*, the host being correctly given as *Cassinopsis capensis*.

Berlese (Icones III, p. 95) quoted the original description of *D. MacOwaniana*, which he said he had not seen. He found two different fungi included in the type collection of *D. capensis*, and described and figured under this name a fungus with spores 4-5  $\times$  1.5  $\mu$  (In the original description of *D. capensis*, the spores are said to be 10  $\times$  2  $\mu$ ).

Berlese also described and figured as a new species *Diatrype Bona-spei*, "Ex specim. *Diatrype capensis* a cl. MacOwan lectis in Herb. Musaei Berol. servatis et mihi a cl. Prof. J. Urban benevole communicatis". This fungus has spores 9-11  $\times$  2-2.5  $\mu$  that is to say,, they agree in measurement with those of *D. capensis* as described by Kalchbrenner and Cooke.

In a recent letter Dr. Sydow stated that the portions of MacOwan's collections in the Berlin Herbarium were very small and in poor condition, and an examination of these failed to clear up the species described by Berlese.

The material in Kew Herbarium is also somewhat fragmentary. The portion of the collection MacOwan 1264 in the cryptogamic herbarium at Pretoria consists of a small branch of *Cassinopsis capensis* and two small pieces of bark from a different tree. The former has been given the number 20951a, and is obviously part of the collection from which both *D. MacOwaniana* and *D. Capensis* were described. The latter (20951b) is identical with a specimen at Kew under the name "*Diatrype cangesta* K. et Cke, Cape, Kalchbrenner R 23". I am unable to find any description of this species, and as the material is in very poor condition, being too old to show either spores or asci, it must be disregarded.

The fungus on *Rubus*, MacOwan 1350, 1344 (Herb. Kew and Pretoria Nos. 21998, 22005) quoted under the name *Diatrype capensis* in Grevillea (l.c.) differs from that on *Cassinopsis capensis*; the material is all too old for detailed study, lacking both asci and spores, and must be disregarded until it can be found again in better condition.

The name *Diatrype MacOwaniana* Thüm. must therefore be adopted for the collection MacOwan 1264, which is on *Cassinopsis capensis*; *D. capensis* K. et Cke. is the same fungus.

Berlese's species *D. Bona-spei* agrees in spore measurements with those given in the original description of *D. capensis*, and his other details and drawings conform with the general structure of that species; the name *D. Bona-spei* must also be regarded as a synonym for *D. MacOwaniana*. Berlese's drawing is reproduced, for comparison with a photograph of a section made from MacOwan 1264;

It is impossible to say what Berlese described and figured as *Diatrype capensis*, with spores 4-5  $\times$  1.5  $\mu$ .

**Diatrype Leonotidis** Doidge nov. sp.

Plate 9 d.

Stromata usually scattered fairly evenly over the surface of the stem, usually discrete, round or somewhat elongated, minute up to  $2.5\ \mu$  diam.; occasionally, when numerous and crowded, 2 or more become fused and form larger, irregular compound stromata. Stromata at first completely immersed in the cortex, pushing up the periderm into raised pustules; the periderm finally ruptures in stellate fashion or irregularly, remaining closely adherent at the sides, but exposing more or less the black, pulvinate or verrucose surface of the stroma, which often remains partially veiled by torn fragments of the periderm.

The stroma consists of a rather brittle, sub-opaque, carbonaceous outer crust, about  $50\ \mu$  thick, composed of roundish-angular, blackish-brown cells  $3.5\text{--}5\ \mu$  diam.; within the ground tissue between the perithecia is sub-hyaline to pale yellowish brown, compact, but without recognisable structure.

Perithecia usually 3-5, rarely up to 8 in a single stroma, arranged in a circle or more or less irregularly, monostichous, globose to ovate, often flattened laterally by mutual pressure,  $300\text{--}400\ \mu$  diam., narrowing suddenly above into the rather short, thick, cylindrical ostioles. Ostioles parallel or somewhat convergent,  $100\text{--}150\ \mu$  long, not protruding from the stroma, or protruding slightly, and then rather shining black and deeply 3-5 sulcate; traversed by a pore about  $50\text{--}75\ \mu$  broad, which is cylindrical, or broadens upwards to ca.  $85\text{--}87.5\ \mu$ ; it is lined with comparatively coarse, spreading hyaline periphyses. Perithecial wall firm, membranous, mostly  $12\text{--}15\ \mu$  thick, composed of several layers of compressed, angular, blackish-brown, rather thin-walled, translucent cells; giving place internally to a hyaline, concentric, filamentous layer of about equal thickness. Asci numerous, clavate, 8-spored, sp. part fusiform,  $35\text{--}45 \times 6\text{--}8\ \mu$ , rounded above, tapering below into a long slender stalk. Spores distichous, continuous, allantoid, light yellow brown, slightly curved,  $10\text{--}12.5 \times 2\text{--}2.5\ \mu$ . Paraphyses hyaline, filiform, about  $1\ \mu$  thick.

on dying stems of *Leonotis* sp., Hlabini, Polela Distr., Doidge, 29821.

**Diatrype caminata** Kalch. et Cke.

Grevillea IX (1880) p. 28; Sacc. Syll. Fung. I, p. 197; Berlese, Icon. Fung. III (1900) p. 92, t. CXIII, fig. 2.

Plate 12 a, b.

Stromata scattered or in groups, discrete or becoming confluent in small groups or series, irregularly round, up to 1 mm. diam., or broadly elliptic and up to 2 mm. long; at first completely immersed in the cortex, rupturing the periderm and exposing the surface of the stroma, which is black, carbonaceous, pulvinate or verrucose, with dull black, 3-5-sulcate, ostioles barely protruding; finally the bark breaks away, leaving the stromata exposed, attached to the wood or to the inner layers of the cortex.

Ground tissue of stroma hyaline or sub-hyaline, without definitely recognisable structure. Outer crust black, carbonaceous, irregular in thickness,  $50\text{--}130\ \mu$  thick, formed of thin-walled, blackish-brown, globose to angular, parenchymatous cells,  $3\text{--}5\ \mu$  diam. The Torn periderm of the host adheres closely to the sides of the stroma.

Perithecia 4-12 in a single stroma, rather large, oblong to ovate, not laterally compressed or very slightly so,  $300\text{--}450\ \mu$  diam.,  $450\text{--}600\ \mu$  high, narrowed above into short broad ostioles. Ostioles parallel, narrow funnel-shaped,  $200\text{--}250\ \mu$  long,  $150\ \mu$  broad at the base, broadening to about  $200\ \mu$  at the sulcate apex which is fused to the outer crust of the stroma and protrudes only slightly; traversed by a pore lined with numerous, fine, hyaline periphyses. Perithecial wall opaque, blackish-brown,  $15\text{--}20\ \mu$  thick, composed of a number of layers of compressed cells, which are thin-walled, blackish-brown and up to  $15\ \mu$  diam.; giving place suddenly within to a sub-hyaline, concentric, filamentous layer. Asci numerous, 8-spored, clavate, rounded and somewhat thickened at the apex, tapering below into a slender stalk, sp. part  $40\text{--}50 \times 6\text{--}8\ \mu$ . Spores distichous or sub-tristichous, allantoid



slightly curved, rarely almost straight, rounded at ends, not tapering or very slightly so, sub-hyaline, pale olivaceous in mass,  $10-14 \times 2.5-3 \mu$ . Paraphyses sparse, disappearing early.

on branches, Cape, *MacOwan* 1263, Type in Herb. Kew.

on branch of *Halleria lucida* L., Knysna, *Bottomley*, 31059.

The type collection, *MacOwan* 1263, is missing from the Cryptogamic Herbarium at Pretoria, and I am indebted to the Director of the Royal Botanic Gardens for a fragment of the type specimen in Kew Herbarium. This material is unfortunately old and no asci or spores could be found, but after studying the stroma and perithecia in section and comparing with Berlese's description and illustrations, little doubt remains that the Knysna collection No. 31059 is *Diatrype caninata*. Berlese's drawing is reproduced for comparison with a photograph of a section through the stroma of No. 31059.

***Diatrype conferta* Doidge, nov. sp.**

Plate 13 a, b.

Stromata in irregular groups or more or less scattered, developing in the cortex but soon becoming erumpent, black, carbonaceous, pulvinate, 1-3 mm. diam., round to elliptic, frequently crowded together and becoming coalescent in small groups. The torn periderm adheres closely to the sides of the stroma, and fragments remain adhering to the surface, which is dull black and rugulose with slightly protruding ostioles.

Stromata seated on the wood, sometimes narrowing somewhat towards the base; inner part light brown at the base, consisting of a fungous tissue composed of rather closely interwoven, thin-walled, yellow brown hyphae,  $2.5-3 \mu$  thick; above and between the perithecia it is white, hyaline, and its structure not easily recognisable. At the surface there is an opaque crust, which is firm, black, carbonaceous, irregular in thickness,  $30-90 \mu$  thick, composed of blackish-brown, rather thin-walled, angular cells, ca.  $2.5-4 \mu$  diam.

Perithecia numerous, up to 30 in a single stroma, crowded, distichous to monostichous, ovate, oblong or irregular through mutual pressure,  $250-400 \mu$  diam., up to  $550 \mu$  high, narrowed rather gradually above into cylindrical or narrow funnel-shaped ostioles. Ostioles  $150-300 \mu$  long, fused at the apex with the outer crust of the stroma from which they protrude very slightly, or more decidedly (up to  $120 \mu$ ); in the latter case the ostioles are dilated and sub-spherical at the apex and up to  $200$  or  $250 \mu$  diam.; traversed by a pore  $50-100 \mu$  broad, which is lined with rather coarse, hyaline paraphyses. Perithecial wall firm, membranous, blackish-brown,  $18-30 \mu$  thick, composed of several layers of compressed cells, giving place inwardly to a sub-hyaline, concentric, filamentous layer  $7-10 \mu$  thick. Asci very numerous, clavate, 8-spored, rounded and thickened at the apex, tapering below into a long, slender stalk, sp. part  $40-50 \times 7.5-8 \mu$ . Spores distichous, pale olive yellow, allantoid, more or less curved, rounded at the ends,  $10-15 \times 2.5-3 \mu$ ; light yellow brown in mass.

on dead branches of tree undet., Xumeni Forest, Donnybrook, *Morgan* and *Doidge*, 30420.

***Diatrypella* Ces. et de Not. emend Wehm.**

Amer. Jour. Bot. 13 (1926) p. 637.

Stroma effuse or isolated. Entostroma well developed, often pustulate, but not usually widely erumpent, bounded by a dark marginal zone. Perithecia immersed in the stroma, clustered or separately erumpent. Ostioles sulcate. Asci with long stalks, polysporous. Spores allantoid, 1-celled, yellow-hyaline.



## KEY TO SOUTH AFRICAN SPECIES.

Spores 10-16 $\times$ 2.5-4 $\mu$ .....	<i>D. Morganae</i> .
Spores 9-12 $\times$ 2-3 $\mu$ .....	<i>D. oligostroma</i> .
Spores 4.5-8 $\times$ 1.5-2.3 $\mu$ , Perithecia 400-750 $\mu$ diam.....	<i>D. Agaves</i> .
Spores 5-7.5 $\times$ 1-1.2 $\mu$ , Perithecia 250-400 $\mu$ diam.....	<i>D. natalensis</i> .
Spores 2.5-5 $\times$ 1 $\mu$ .....	<i>D. pretoriensis</i> .

**Diatrypella Agaves Syd.**

Ann. Myc. 37 (1939) pp. 186-187.

Plates 3 a and 14 b.

Stromata widely and irregularly scattered, sometimes quite discrete, sometimes more or less closely massed together and forming parallel, longitudinal rows or series of varying length, following the direction of the fibres of the host; usually remaining covered, erumpent only at the apex through fissures in the periderm, finally becoming more or less free, but still covered by adhering shreds of the tissues of the host; less frequently the covering layer of the host tissues fall away completely, and the stromata are apparently superficial. Stromata round, elliptic or irregular in outline, finely verrucose or pulvinate, convex, dull black or blackish-brown, 0.75 to 1.5 mm. diam., or up to 2 mm. long and 1.5 mm. broad; when closely crowded, becoming confluent and more or less completely fused and forming larger, composite stromata.

Parenchymatous tissue of the stroma rather brittle and carbonaceous when old, consisting of round or angular, thick-walled, translucent, blackish-brown cells, 3-6  $\mu$  diam.; the ground tissue between the perithecia is often very light yellowish-brown.

Perithecia immersed in the stroma, monostichous, globose or broadly ovate, often somewhat irregular through lateral pressure, very variable in size, usually 400-750  $\mu$  diam., narrowing above into comparatively short, thick ostioles. Ostioles not protruding, or protruding slightly from the surface of the stroma, truncate or stellately 5-sulcate, traversed by a pore which is lined with numerous, short, filamentous periphyses. Perithecial wall membranous, usually 20-40  $\mu$  thick, composed of a number of layers of rather closely compressed cells; cells thick-walled, translucent, blackish-brown, up to 8  $\mu$  diam.; giving place suddenly within to a sub-hyaline, indefinitely concentric, filamentous layer. Asci very numerous, many-spored, clavate, broadly rounded above, tapering below into a delicate, rather long stalk, sp. part 68-85  $\times$  8-12  $\mu$ . Spores conglobate, cylindrical, broadly rounded at the ends, not tapering or very slightly so, allantoid, slightly curved, less frequently almost straight, 1-celled, hyaline, honey yellow in mass, 4.5-8  $\times$  1.5-2.3  $\mu$ . Paraphyses sparse, very broadly filamentous, early collapsing and becoming mucilaginous.

on dying peduncles of *Agave americana* L., The Willows, Pretoria Distr., Doidge and Bottomley, 28899.

**Diatrypella natalensis Doidge nov. sp.**

Plate 14 c.

Stromata scattered irregularly, sometimes quite discrete, sometimes more or less closely massed together in irregular groups or in short series; more or less circular in outline, up to 1 mm. diam., or elongated and up to 3 mm. long and 1 mm. broad; at first covered, then more or less free, black, convex, pulvinate, the surface roughened by clinging fragments of the ruptured periderm.

At the surface, the stroma is firm, black, opaque, carbonaceous and rather brittle, composed of more or less angular, translucent, blackish-brown, parenchymatous cells ca. 6-8  $\mu$  diam.; within it becomes gradually paler and less closely compacted, and the ground tissue between the perithecia is sub-hyaline and more or less filamentous in structure. The unaltered, or somewhat altered elements of the host tissues are in places included in the stroma, especially just under the outer crust.

Perithecia 7-15 in each single stroma, arranged more or less in circles in the round stromata, or in two lines in the elongated stromata: completely immersed, monostichous, globose or ovate, but usually more or less flat-sided and irregular through mutual pressure, 250-400  $\mu$  diam., 300-500  $\mu$  high, narrowing suddenly above into the short, thick, more or less cylindrical ostioles. Ostioles 150-220  $\mu$  long, 100-150  $\mu$  broad at the base, usually broadening upwards to 150-200  $\mu$  where they protrude slightly from the stroma, shining black, delicately 3-5-sulcate at the apex: traversed by a funnel-shaped pore, which is lined with numerous, hyaline or yellowish, filamentous periphyses. Perithecial wall firm, membranous, 12.5-25  $\mu$  thick, composed of several layers of very much flattened, blackish-brown cells measuring up to 15  $\mu$  diam.; giving place internally to a concentric, hyaline, filamentous layer of about equal thickness. Asci numerous, closely packed with very numerous, minute spores, clavate, straight or curved, rounded at the apex, tapering downwards into a slender hyaline stalk, sp. part 80  $100 \times 12.5-15 \mu$ . Spores allantoid, continuous, more or less curved, rounded at the ends, sub-hyaline, light yellow-brown in mass, 5-7.5  $\times$  1-1.2  $\mu$ . Paraphyses not seen.

on stems of *Citrus nobilis* Lour., Glen Echo, Umtwalumi, Natal, Wayne, 21006.

### ***Diatrypella Morganae* Doidge nov. sp.**

Plate 13 c.

Stromata scattered over the whole surface of the branch, usually discrete, sometimes more or less crowded, circular or sub-circular in outline, 1-2.5 mm. diam.; pushing up the periderm into raised pustules, but usually remaining covered with only the black shining ostioles erumpent; rarely the bark breaks away irregularly and leaves the stroma exposed.

Intramatrix stroma very poorly developed, consisting of the more or less altered elements of the tissues of the host, between which a fungous tissue can be detected; this is firm and dark at the surface, where there is a poorly developed outer crust, which varies greatly in thickness and is not continuous; within, the fungous tissue is hyaline or light yellow-brown, small celled and indefinitely filamentous.

Perithecia in more or less regular circles, 3-7 in a stroma, often rather irregularly spaced, completely immersed, sub-globose to ovate, either rather distant from one another, or crowded and flat-sided through mutual pressure, 250-500  $\mu$  diam., narrowed suddenly above into the thick, cylindrical ostioles. Ostioles mostly 150-200  $\mu$  thick, convergent, protruding slightly from the stroma, slightly broader above with delicately sulcate margin, lined internally with numerous, very fine, hyaline periphyses. Perithecial wall firm, membranous, uneven in thickness, mostly 20-30  $\mu$  thick at the base and sides, formed of several layers of blackish-brown, translucent, rather thin-walled, compressed cells, which are mostly 10-15  $\mu$  diam.; giving place internally to a concentric, hyaline, filamentous layer. Asci numerous, many spored, cylindrical or clavate, rounded above, sessile or briefly pedicellate, 100-125  $\times$  12-15  $\mu$ , at length disappearing and leaving the spores free in the perithecium. Spores allantoid, continuous, rounded at the ends, pale yellow-brown, almost red-brown in mass, 10-16  $\times$  2.5-4  $\mu$ . Paraphyses hyaline, filamentous, disappearing early.

on dry branches of undet. tree, Hlabini, Polela Distr., Natal, *Morgan* and *Doidge*, 29820.

In old stromata, the perithecial cavity is invaded by a second ascomycete, apparently parasitic on the *Diatrypella*. This has 8-spored asci with brown, 3-septate spores, which are sub-cylindrical but tapering somewhat to the rounded ends, slightly constricted at the septa, and about 22-28  $\times$  6-7  $\mu$ .

### ***Diatrypella pretoriensis* Doidge, nov. sp.**

Plate 15 a, b.

Stromata rather closely crowded, in large irregular groups, usually discrete, more or less circular in outline and up to 1 mm. diam.; at first immersed, then rupturing the blistered periderm and becoming more or less free, convex, pulvinate, the surface being roughened by clinging fragments of the periderm from which only the black, sulcate ostioles protrude; the torn periderm adheres closely to the sides of the stroma.

Ground tissue of stroma hyaline to yellowish-brown, without definitely recognisable structure; some of the less destructible elements of the host tissue are included in places in the stroma; outer crust black, carbonaceous, opaque, varying in thickness, mostly 50–60  $\mu$  thick, occasionally up to 75  $\mu$ .

Perithecia 2–12 in each stroma, arranged irregularly and usually remote from one another, not crowded, globose to ovate, 400–500  $\mu$  diam., narrowed suddenly above into short, cylindrical ostioles. Ostioles 150–220  $\mu$  long, about 100  $\mu$  broad, expanding at the hemispherical apex to ca. 150  $\mu$ , fused with the outer crust of the stroma and barely protruding from it; traversed by a broad pore lined with very numerous, hyaline periphyses. Perithecial wall firm, membranous, 10–12·5  $\mu$  thick, blackish-brown, sub-opaque, composed of several layers of angular, thin-walled, compressed cells, ca. 4–6  $\mu$  diam.; giving place internally to a rather loosely woven, filamentous, hyaline or pale yellow layer, ca. 15  $\mu$  thick. Asci numerous, packed with numerous minute spores, straight or curved, rounded at the apex, tapering downwards into a slender stalk, sp. part 40–60  $\times$  10–12·5  $\mu$ . Paraphyses not seen. Spores allantoid, more or less curved, rarely almost straight, sub-hyaline, light yellow-brown in mass, 2·5–4  $\times$  1  $\mu$ ; less frequently up to 5  $\mu$  long.

on roots of *Populus* sp., De Beersrust, Pretoria Distr., *Doidge*, 31072.

### ***Diatrypella oligostroma* Syd.**

Ann. Myc. 37 (1939) pp. 187–189.

Plate 14 a.

Stromata minute, round, broadly elliptic or rather irregular, flat and verrucose or thick and pulvinate, 1–2 mm. diam.; or more or less effuse, diatrypoid, up to 8 mm. diam., and irregular in outline. Intramatrical stroma poorly developed, consisting of the altered elements of the substratum, between which a fungous tissue can be detected; this is hyaline or light yellow-brown, small-celled and indefinitely filamentous.

Perithecia rather irregularly spaced, monostichous, completely immersed in the stroma, sub-globose, broadly ovate, or becoming flat-sided through lateral pressure, irregular in size, usually 300–600  $\mu$  diam. Ostioles broadly cylindrical, single, not fasciculate, protruding slightly but definitely, usually with a narrow funnel-shaped pore and a thickened ring-like margin, sometimes delicately and irregularly sulcate. Perithecial wall rather thick, membranous, 30–50  $\mu$  thick, consisting of several layers of very closely compressed cells, 5–8  $\mu$  diam.; these are irregularly angular, rather thin-walled, light greyish-brown, and give place internally to a hyaline, concentric, filamentous layer; in the ostiole the tissue is erect, filamentous, and consists of parallel, short-celled, thick-walled hyphae, 2–3  $\mu$  thick. Asci very numerous, clavate, broadly rounded above, tapering gradually downwards into a very delicate stalk, thin-walled, many-spored, sp. part 60–85  $\times$  12–15  $\mu$ . Spores conglobate, cylindrical, broadly rounded at the ends, not tapering or slightly so, weakly allantoid, seldom almost straight, light yellow or greyish brown, dark honey yellow in mass, 9–12·5  $\times$  2–3  $\mu$ . Paraphyses very sparse, early collapsing and becoming mucilaginous.

on dead branches of *Halleria lucida* L., Trigaartspoort, Pretoria distr., *Doidge* and *Bottomley*, 30379; Boschfontein, Rustenburg distr., *Doidge* and *Bottomley*, 30896.

associated with *Eutypella Doidgeae* Syd., on the same branches.

### ***Peroneutypella* Berl.**

Icones Fung. III (1900) p. 82.

Stroma effuse, black, covered by the periderm or the epidermis. Acervuli more or less pustuliform and erumpent. Perithecia more or less numerous in each group, monostichous to polystichous, prolonged into long protruding ostioles. Ostioles entire or sulcate. Asci clavate, filling the perithecial cavity. Spores continuous, allantoid, hyaline or sub-hyaline, often yellowish-brown in mass.



V. Höhnelt (9 : pp. 130, 132) includes this genus in his sub-family *Valseae*, but regards *Peroneutypella* Berl. as a synonym for *Scoptria* Nits.

#### KEY TO SOUTH AFRICAN SPECIES.

- Ostioles entire, sterile emergences present..... *P. cylindrica*.  
 Ostioles sulcate, no sterile emergences..... *P. infinitissima*.

#### *Peroneutypa a cylindrica* (K. et Cke.) Berl.

Icones Fung. III (1900) p. 82, Tab. C (ex specimen origin. a cl. Cooke).

Syn : *Ceratostoma cylindrica* K. et Cke., Grev. IX. (1880) p. 29, t. 137, f. 28.

*Calosphaeria cylindrica* (K. et Cke.) Sacc., Syll. Fung. I, p. 98.

Plates 3 b and 5 a, b.

Stromata widely effuse, developing in the cortex and spreading over large areas of the branch ; acervuli numerous, scattered, irregularly round and ca. 0.5 mm. diam., or somewhat elongated and up to 1 mm. long ; sometimes crowded in short, irregular series parallel with the axis of the branch. The long ostioles, surrounded by sterile, setal-like emergences, become erumpent through longitudinal cracks in the bark and give the appearance of tufts of short, stiff, black hairs, visible to the naked eye.

The lower part of the stroma consists of a more or less closely interwoven tissue of fine hyphae, sub-hyaline to light yellowish-brown, permeating the cells of the host which are unaltered or only slightly altered. The fungous tissue becomes more compact near the upper surface, and forms, above the perithecia, a dark brown, sub-opaque, parenchymatous layer, composed of cells which are rather thin-walled and ca. 4-5  $\mu$  diam. Frequently this outer crust gives rise to erect, brown, turf-like tufts of stromatal tissue, 100-150  $\mu$  high, which remain covered by the periderm. In the immediate vicinity of the fasciculate ostioles, the stromatal tissue is prolonged into spreading or erect plates, which taper from a rather broad base ; these are composed of olive brown, parallel, rather thick-walled hyphae, 2.5-3  $\mu$  thick, irregularly and rather distantly septate and fused by their lateral walls. These sterile emergences are almost equal in length to the protruding ostioles.

Perithecia monostichous, rarely sub-distichous, deeply immersed in the stroma, usually in groups of 2-7, rarely up to 9, globose to ovate, sometimes becoming ellipsoid through lateral pressure, 350-650  $\mu$  diam., 550-750  $\mu$  high, narrowing suddenly above into long, cylindrical ostioles. Perithecial wall blackish-brown, opaque, firm membranous, mostly 45-50  $\mu$  thick ; giving place within to a sub-hyaline layer, 10-12  $\mu$  thick, composed of several layers of thin-walled, strongly compressed cells ; in the ostioles the wall consists of oblong cells, arranged in ascending, more or less vertical rows. Ostioles fasciculate, converging to the outer surface of the stroma, where they are more or less connate, then erumpent, erect or more or less divergent ; 1.5-1.7 mm. long, of which ca. 1 mm. protrudes from the stroma, readily breaking off just above the surface of the branch and becoming truncate, irregularly cylindrical, 100-150  $\mu$  thick, entire and rounded at the apex ; traversed by a pore, 50-75  $\mu$  broad, which is lined with fine, hyaline periphyses. Asci extremely numerous, almost filling the perithecial cavity, 8-spored, clavate, rounded above, tapering below into a slender stalk which is of varying length, sp. part 15-18  $\times$  4-5  $\mu$ . Spores distichous, allantoid, sub-hyaline, pale olivaceous in mass, curved, minute, 3-4  $\times$  1-1.25  $\mu$ .

on dead branches of ?*Solanum auriculatum* Ait., Xumeni Forest, Donnybrook, Natal, Morgan and Doidge, 28918, 31061, 31064 ; Woodbush, K. M. Putterill, 36753.

Compared with a fragment of the co-type in Herb. Kew sub *Calosphaeria cylindrica* (K. et Cke.) Sacc., "Cap. B.Sp. et P. Natal, comm. MacOwan." The type collection is missing from the Cryptogamic Herbarium in Pretoria.



**Peroneutypella infinitissima** (K. et Cke.) Doidge n. comb.

Syn. *Valsa infinitissima* Kalch. et Cke., Grevillea IX (1880) p. 28 ; Sacc. Syll. Fung. I. p. 144.  
Plate 4 a, b.

Stromata scattered over the surface of the branch, usually remote, discrete, very rarely close together and becoming confluent, developing in the cortex ; acervuli pustuliform, round to irregular, minute, up to 0.5 mm. diam., remaining covered by the periderm of the host, from which only the ostioles protrude.

The inner part of the stroma consists of a fungous tissue composed of very fine, hyaline to yellowish-brown hyphae which are more or less closely interwoven and permeate the cells of the host which are not altered, or very slightly so. Above, covered by the periderm, the stroma is defined by a dark brown line, consisting of very closely interwoven dark brown hyphae about 2  $\mu$  thick, amongst which the outline of the cells of the host is plainly visible. This dark line is also evident irregularly at the base. Apex of stroma pulvinate, consisting of light brown, thin-walled hyphae 2-5  $\mu$  thick, much branched and closely interwoven, but more or less vertical ; becoming more closely compact above, and forming a close, brown parenchyma of thin-walled cells 3-5  $\mu$  diam. ; this apical tissue is traversed by the ostioles.

Perithecia usually 2-8 in each stroma, rarely up to 15, deeply immersed in the stroma, sub-globose to ovate, usually slightly separated and not compressed, 300-450  $\mu$  diam., 400-550  $\mu$  high, narrowing suddenly above into long, cylindrical ostioles. Perithecial wall dark brown, firm, membranous, sub-opaque, 20-25  $\mu$  thick, composed of several layers of dark brown, somewhat compressed cells ca. 5  $\mu$  diam. ; giving place suddenly within to a hyaline layer ca. 10  $\mu$  thick. Ostioles long, cylindrical, straight or converging to the apex of the stroma, then diverging slightly or remaining parallel, 900-1200  $\mu$  long, only about 200-250  $\mu$  being erumpent, slender, ca. 100  $\mu$  thick, slightly dilated and delicately 3-5-sulcate at the apex ; wall similar to that of the perithecial cavity ; traversed by a pore, which is lined with numerous, fine, hyaline periphyses. Asci very numerous, filling the perithecial cavity, clavate, 8-spored, sp. part 10-12.5  $\times$  4-5  $\mu$ . Spores allantoid, sub-hyaline, light yellow-brown in mass, rounded at ends, usually strongly curved with the outer wall almost semi-circular, 2.5-4  $\times$  1-1.25  $\mu$ .

on dead branches of undet. tree, Somerset East, *MacOwan 1344a*, 22006.

The long protruding, sulcate ostioles separate this fungus from the genus *Valsa*.

**Valsa** Fr. emend. Sacc.

Consp. Gen. Pyr. p. 4.

Stromata isolated or confluent, formed from more or less closely interwoven hyphae traversing the tissues of the cortex, which are not altered or only slightly so. Perithecia arranged in a circle, with convergent ostioles ; ostioles entire, not sulcate. Asci sessile or sub-sessile, filling the perithecial cavity. Spores hyaline, allantoid. Pycnidial stage *Cytospora*.

KEY- TO SOUTH AFRICAN SPECIES.

Spores 9-12 $\times$ 2-2.5 $\mu$ .....	<i>V. leucostoma</i> .
Spores 12-18 $\times$ 2.5-4 $\mu$ .....	<i>V. salicina</i> .

**Valsa leucostoma** (Pers.) Fr.

Summ. Veg. Scand. p. 411 ; Sacc. Syll. Fung. I (1882) p. 139 ; Ell. and Ev., N. Amer. Pyren. (1892) p. 485 ; Hopkins, Trans. Rhod. Sc. Ass. 35 (1938) p. 102.

Plate 4 b.

Stromata scattered irregularly, sometimes confluent, convex, pustuliform, 2-3 mm. diam., finally rupturing the periderm and becoming more or less erumpent, with only the disc protruding ; disc whitish, round to elliptic, traversed by the ostioles which appear black-shining, punctiform on the surface ; elsewhere the stroma is veiled by the closely adherent periderm.

Stroma not well developed, composed of more or less closely interwoven, branched hyphae 5-6  $\mu$  thick, sub-hyaline to fuscous, traversing the tissues of the cortex; more closely interwoven above, forming a pale, compact, erumpent disc which is traversed by the ostioles.

Perithecia 3-10 rarely up to 20 in a single stroma, globose or flattened-globose, 250-500  $\mu$  diam., narrowing suddenly above into the ostioles; ostioles more or less curved, convergent, pale yellow-brown, up to 750  $\mu$  long, not protruding or very slightly so; traversed by a pore which is lined with fine, hyaline periphyses. Perithecial wall rather light brown, 15-20  $\mu$  thick, composed of several layers of slightly compressed, thin-walled cells; becoming gradually paler within and finally giving place to a hyaline filamentous layer. Asci very numerous, filling the perithecial cavity, 8-spored, fusoid-clavate, 35-45  $\times$  7-8  $\mu$ , sub-sessile. Spores distichous, allantoid, hyaline, slightly curved, 9-12  $\times$  2-2.5  $\mu$ .

on branches of *Prunus domestica* L., Henley on Klip, Higginson, 21585.

on *Pyrus malus* L., Salisbury, *Rh.* 973.

The sub-genus *Leucostoma* to which this species belongs, is treated as a separate genus by von Höhnelt (9) and Wehmeyer (10). The conidial form, *Cytospora leucostoma* (Pers.) Sacc. occurs generally throughout the Union, especially in the south-west Cape, the Orange Free State and the Transvaal. It is common on branches of *Pyrus malus*, causing "Apple Die Back" (2), and is occasionally found on plum, peach and apricot branches. The ascus stage is rarely found.

I am indebted to Dr. J. C. Hopkins for a portion of the specimen in the Rhodesian Herbarium at Salisbury.

### ***Valsa salicina* (Pers.) Fr.**

Summ. Veg. Scand. p. 412; Sacc. Syll. Fung. I p. 131; Ell. and Ev., N. Amer. Pyr. (1892) p. 477; Kalchbrenner, *Grevillea* X (1882) p. 146.

Stromata thickly scattered, conical-truncate on a round base, slightly prominent, pustuliform, remaining covered by the adherent periderm, except the small, whitish disc.

Perithecia 6-12 in each stroma, arranged in a circle in the inner bark, of which the elements remain unchanged; with very short, slender ostioles emerging through the disc, round the margin or scattered through it, the entire apex barely protruding; traversed by a very narrow pore. Asci narrow-oblong or clavate, 4-8-spored, sub-sessile, 40-65  $\times$  7-8  $\mu$ . Spores allantoid, hyaline, slightly curved, 12-18  $\times$  2.5-4  $\mu$  in the 8-spored asci, 20-30  $\times$  5-7  $\mu$  in the 4-spored asci.

on branch of *Salix* sp., Somerset East, *MacOwan* 1283.

This specimen is missing from the Cryptogamic Herbarium, Pretoria, and has not been found in the Kew Herbarium or in the South African Museum, Cape Town. The description given above is taken from Ellis and Everhart (l.c.)

### ***Cryptosporella* Sacc.**

Syll. Fung. I (1882) p. 466.

Stromata isolated. Ectostroma forming a small conical disc. Entostroma not developed. Perithecia immersed in the unaltered bark, no marginal line present. Ascospores elliptical to fusoid, hyaline, 1-celled.

The ascus stage of *Cryptosporella* has not been observed, and only one conidial form of this genus has been recorded in South Africa.

**Cryptosporella umbrina** (Jenkins) Wehm.

The Genus *Diaporthe* (1933) p. 270.

Syn. *Diaporthe umbrina* Jenkins, Jour. Agric. Res. 15 (1918) pp. 593-599.

The *Phomopsis* form of this fungus, causing a stem canker of *Rosa* spp., has been recorded from Johannesburg, 30444, and from Kokstad, 30445.

**Diaporthe** Nitschke emend. Wehm.

Amer. Jour. Bot. 13 (1926) p. 638.

Stromata effuse or isolated. Entostromatic areas more or less differentiated and light in colour; a blackening of the sub-stratum always present, either on the surface of the substratum as a marginal zone, or as a marginal zone about the entostromatic areas. Paraphyses few and evanescent. Ascospores ellipsoid or fusoid, hyaline, 2-celled, sometimes apiculate. Imperfect stage belonging to the genus *Phomopsis*.

Certain plant diseases caused by fungi of the form genus *Phomopsis* occur in South Africa, but no ascus stage of the genus *Diaporthe* has been found.

**Diaporthe citri** (Fawc.) Wolf.

Jour. Agric. Res. (1926) 621-625.

is regarded by Wehmeyer (12, p. 102) as a host form of *Diaporthe Medusaea* Nits. The conidial form, *Phomopsis Citri* Fawc., occurs fairly commonly in the Union and in Rhodesia on fruit and twigs of *Citrus* spp. (2 pp. 44, 45).

**Diaporthe perniciosa** March.

Bull. Soc. roy. de bot. Belg. 54 (1921) is regarded by Wehmeyer (12 p. 89) as a host form of *Diaporthe eres* Nits. The *Phomopsis* stage has been observed in Rhodesia (4 p. 101) on twigs of *Pyrus malus*.

**Valsaria** Ces. et de Not. pro parte.

Schema sferiacei ital. (1863) p. 205; emend Wehm.

Amer. Jour. Bot. 13 (1926) p. 640.

Stromata isolated or confluent. Entostroma very strongly developed, often erumpent, bounded by a dark, marginal zone, usually coloured. Paraphyses numerous and persistent. Ascospores uniseriate, elliptic-fusoid, 2-celled, brown.

## KEY TO SOUTH AFRICAN SPECIES.

Spores cylindrical, not constricted.....	<i>V. Eucalypti</i> .
Spores fusoid, constricted.....	<i>V. natalensis</i> .

**Valsaria Eucalypti** (Kalch. et. Cke.) Sacc.

Syll. Fung. I (1882) p. 746.

Syn. *Melogramma Eucalypti* Kalch. et Cke., Grevillea IX (1880) p. 31.

Plate 15 c.

Stromata developing in the bark, erumpent and early becoming superficial, attached only at the base, pulvinate, cinnamon brown; at first small, round to elliptic, up to 2 mm. diam.; developing in groups, becoming confluent and fusing to form large irregular stromatic cushions up to 2 cm. long and 5 mm. broad; surface of stroma somewhat rugulose, and seamed with irregular fissures.



Stroma diatrypoid; ground tissue consisting of a pale to light brown fungous tissue, formed of more or less closely interwoven hyphae  $2.5\text{--}3.5\ \mu$  thick. This becomes gradually more compact towards the surface, where it is dark cinnamon brown, sub-opaque, parenchymatous, composed of rather thin-walled, angular cells,  $3\text{--}5\ \mu$  diam.

Perithecia 2-6 in each individual stroma, monostichous, often rather distant from one another, globose to ovate, only slightly flat-sided through mutual pressure; or arranged irregularly, closely crowded and irregular in shape;  $170\text{--}275\ \mu$  diam., narrowing suddenly or rather gradually above into cylindrical ostioles ca.  $150\ \mu$  long (total height of perithecia including ostiole  $350\text{--}500\ \mu$ ); ostioles not sharply differentiated from the tissue of the stroma, not protruding; traversed by a pore ca.  $55\ \mu$  broad, lined with hyaline periphyses. Perithecial wall dark brown, membranous, ca.  $10\text{--}12\ \mu$  thick, composed of a few layers of somewhat compressed cells; not very sharply defined, more or less continuous outwardly with the tissue of the stroma, and giving place within to a sub-hyaline, concentric, filamentous layer. Asci fairly numerous, 8-spored, cylindrical, rounded above, tapering slightly at the base to a short club-shaped or peg-like foot,  $80\text{--}100 \times 11\text{--}12.5\ \mu$ . Paraphyses rather numerous, hyaline, filamentous. Spores obliquely monostichous, dark brown, oblong, ellipsoid, broadly rounded at both ends, 1-septate, not constricted,  $12.5\text{--}18 \times 6\text{--}8\ \mu$ , mostly  $15 \times 7\text{--}7.5\ \mu$ ; loculi about equal; epispore minutely verrucose at maturity.

on bark from trunks of *Eucalyptus globulus* Lab., Somerset East, MacOwan 1179, (S.A.M. 33848).

I am indebted to the Director of the South African Museum for the loan of this specimen.

### ***Valsaria natalensis* Doidge nov. sp.**

Plate 15 e.

Stromata scattered unevenly over the whole surface of the stem, sometimes single, more frequently more or less confluent, or fused in small or larger groups, quite immersed in the cortex with only the ostioles punctiform-erumpent, or pushing up the periderm into raised pustules and rupturing it irregularly; single stromata irregularly circular in outline, up to 1 mm. diam.

The lower part of the stroma consists of a filamentous fungous tissue, formed of tortuous, more or less closely interwoven, sub-hyaline to pale yellow-brown hyphae, up to  $2.5\ \mu$  thick, amongst which the unaltered or slightly altered cells of the host can be seen; this is bounded below and at the sides by a thin blackish-brown line; above there is a firm, pale yellow-brown, more closely compact tissue, forming a disc traversed by the ostioles; becoming dark brown, parenchymatous at the surface, where it is composed of irregularly round, more or less angular cells ca.  $5\text{--}6\ \mu$  diam.; the torn periderm adheres firmly to the sides of the stroma.

Perithecia sometimes single, sometimes 2-4 or more in a single stroma, placed in an irregular circle or quite irregularly, monostichous, globose to ovate, or becoming irregular through lateral pressure,  $200\text{--}450\ \mu$  diam., rather deeply immersed, narrowing suddenly above into the ostioles. Ostioles mostly straight, parallel, rarely more or less convergent, sub-cylindrical or tapering somewhat upwards,  $250\text{--}350\ \mu$  long,  $75\text{--}100\ \mu$  broad, with entire margin, not protruding from the stroma; traversed by a pore, which is sometimes more or less cylindrical, but more frequently narrow-conical, lined with rather sparse, very fine, hyaline, ascending periphyses. Perithecial wall mostly about  $25\text{--}30\ \mu$  thick, composed of several layers of compressed cells, which are usually yellow-brown at the base and sides, becoming darker above, and opaque, blackish-brown in the ostioles; not sharply defined outwardly, where it is continuous with the tissue of the stroma; giving place suddenly within to a concentric, hyaline, filamentous layer. Asci very numerous, 8-spored, clavate, rounded above, tapering below into a long, slender, hyaline stalk, which is quite filamentous at the base, total length  $100\text{--}150\ \mu$  sp. part  $50\text{--}72.5 \times 11\text{--}12.5\ \mu$ . Spores distichous, brown, fusoid or ellipsoid, 1-septate, constricted, usually tapering more or less to the bluntly conical



or rounded ends,  $12.5-16 \times 5.5-6.5 \mu$ ; cells usually equal or sub-equal, but sometimes the upper is slightly shorter and broader than the lower. Paraphyses numerous, hyaline, filiform, about  $1 \mu$  thick.

on dead branches of *Solanum auriculatum* Ait., Xumeni Forest, near Donnybrook, Natal, *Morgan and Doidge*, 28931, 30373.

### **Pseudothitis Theiss. et Syd.**

Ann. Myc. 12 (1914) p. 274, and 16 (1918) p. 180.

Stromata foliicolous, seated on the unaltered palisade cells, at first covered by a black-shining, epidermal clypeus, later rupturing and throwing off the epidermis, and becoming rough, brown, conspicuous and apparently superficial. Stroma reddish brown, verruciform. Perithecia immersed, globose, with light brown to pale walls and periphysate ostioles. Asci paraphysate, cylindrical-clavate, 8-spored. Spores brown, unequally 2-celled.

### **Pseudothitis Pterocarpi Syd.**

Ann. Myc. 13 (1915) p. 339; Petrak, Ann. Myc. 27 (1929) p. 330.

Syn. *Systremma Pterocarpi* Doidge, *Bothalia* 1 (1922) p. 70.

*Dothidea Pterocarpi* Syd., Phil. Jour. Sci. VIII (1913) p. 280.

Plate 15 c.

Stromata epiphyllous, rarely hypophyllous, on yellowish leaf spots, developing under the epidermis and becoming erumpent, scattered, round, pulvinate, black, rugulose,  $0.5-1.5$  mm. diam.; usually with a concentric zone of secondary stromata surrounding the primary stroma. Stromata may also occur on twigs and midribs; these are similar to those on the leaves but are usually oval to ellipsoid and solitary.

Tissue of stroma rather loosely parenchymatous in structure, composed of light brown to blackish-brown, round to angular, thin-walled cells, mostly  $5-10 \mu$  diam.; ground tissue between the perithecia paler; often becoming more firmly compacted at the surface, and forming a darker, sub-opaque crust, which is interrupted by the paler ostioles of the perithecia.

Perithecia 1-5 in a single stroma, flattened globose or ovate, deeply immersed,  $120-250 \mu$  diam., narrowing suddenly above into the ostioles. Ostioles up to  $150 \mu$  long, cylindrical to narrow funnel-shaped, not sharply differentiated from the stroma but ca.  $45-50 \mu$  broad, widening at the apex to  $75 \mu$ , not protruding or very slightly so, apex of ostiole pale, almost sub-hyaline; traversed by a pore lined with hyaline paraphyses: Perithecial wall consisting of several layers of pale, rather thin-walled, somewhat compressed cells. Asci numerous, 8-spored, cylindrical-clavate, broadly rounded above,  $48-70 \times 10-16 \mu$ . Spores distichous, brown, oblong,  $10-13 \times 5-7 \mu$ , unequally 1-septate; upper loculus  $6-8.6$ , lower  $3.3-5 \mu$  long.

on leaves and stems of *Pterocarpus rotundifolius* (Sond.) Druce, Khamsi Ruins, S. Rhodesia, *Bottomley*, 14101.

Petrak (l.c.) pointed out that the South African fungus is identical with the species originally described by Sydow as *Dothidea Pterocarpi* from the Philippines.

### **Holstiella P. Henn.**

Pilze Ostafrikas (1895) p. 33.

Stromata superficial, pulvinate or hemispherical: ostioles at first conical, acute, then depressed or concave: perithecia numerous, immersed. Asci clavate, pedicellate, 8-spored, paraphysate. Spores fusoid or clavate, multi-septate, more or less constricted at the septa, hyaline, with a mucous sheath.

**Holstiella usambarensis** P. Henn.-forma.

Pilz. Ostaf. p. 33; Sacc. Syll. Fung. XIV, p. 594; Syd., Ann. Myc. 24 (1926) p. 271.

Stromata rather closely and evenly scattered over large areas of the bark, discrete, or in short uneven rows and then becoming more or less confluent and fused; round, elongated or irregular in outline and apparently quite superficial, about 1–2 mm. diam., convex, pulvinate, with grey-brown or blackish-brown surface roughened by the punctiform-erumpent ostioles. Stroma developing in the outer layers of the cortex, which is normally about 30  $\mu$  thick and becomes thickened to about 800  $\mu$ .

Stroma flat at the base and not sharply defined; ground tissue parenchymatous, including in places shrunken vestiges of the host tissues, composed of rather small, thick-walled, angular cells; the cells are sometimes translucent, light yellowish-brown, and sometimes, especially at the surface, darker, blackish-brown or olive brown.

Perithecia numerous, monostichous, closely crowded or comparatively distant, broadly ovate or ellipsoid, 200–400  $\mu$  diam., up to 800  $\mu$  high, including the ostioles, gradually narrowed above into the ostioles. Ostioles broadly conical and truncate, about 200  $\mu$  long and 150  $\mu$  broad, punctiform erumpent, but not protruding; lined with copious periphyses. Perithecial wall carbonaceous, very variable in thickness, sometimes only 10–15  $\mu$  thick, sometimes up to 40  $\mu$ , opaque, blackish-brown, composed of small cells; at the tips of the ostioles, the cells are yellow-brown or sometimes quite hyaline. Asci numerous, broadly clavate, broadly rounded above, tapering more or less downwards, sessile or with a short thick foot, 8-spored, sp. part 95–100  $\times$  18–22  $\mu$ , thick-walled, slightly thickened at the apex. Spores distichous or incompletely tritichous, fusiform, tapering to blunt ends, straight or slightly bent, hyaline, 7–9-septate, not constricted, 35–42  $\mu$  long, 8–10  $\mu$  broad, not including the mucilaginous envelope which is about 2.5  $\mu$  thick; central cells narrow ellipsoid, 3.5–5  $\mu$  long, becoming shorter towards the ends; terminal cells short, conical. Paraphyses very numerous, coarsely filamentous, freely branched, about 1  $\mu$  thick.

on bark, Lourenco Marques, *Junod*, 12206.

The type was described by Hennings on branches of a tropical African tree. The fungus described above is considered by Sydow (loc. cit.) to be a form of *Holstiella usambarensis*, from which it differs in the size of the spores; they are smaller and have fewer septations; no other differences were observed. In Hennings' type, spores are seen with 11–14 septa and up to 55  $\mu$  long.

**Calospora** Sacc.

Syll. Fung. II (1883) p. 231.

Stromata immersed in the cortex, valsoid, pustulate. Asci typically 8-spored, paraphysate. Spores oblong or fusoid, 2-pluri-septate, hyaline.

**Calospora Bottomleyae** Doidge, nov. sp.

Stromata scattered, or in irregular, elongated groups, developing in the cortex, pushing up the periderm and becoming erumpent, dull black, only slightly convex, elliptic, up to 1.5 mm. long. The cortical tissues finally break away, leaving the stroma exposed and attached at the base to the wood of the host.

Inner part of stroma consisting of more or less closely interwoven hyphae, permeating the cortical cells of the host: fungous tissue sub-hyaline to pale yellow-brown, formed of hyphae 3–4  $\mu$  thick; the cells of the host are not altered or very slightly so. The fungous tissue is darker and more closely interwoven near the surface, forming a dark brown, sub-opaque crust 25–35  $\mu$  thick; the dark zone is somewhat thinner and less dense at the sides and at the base where it rests on the wood.

Perithecia 1–5 in a single stroma, distant, solitary, or arranged in a line or irregular circle, globose or globose-depressed, 180–280  $\mu$  diam., 150–200  $\mu$  high, narrowing suddenly

above into the ostioles. Perithecial wall, firm, membranous, 12–20  $\mu$  thick; dark brown and well defined at the base where it is about 15  $\mu$  thick; elsewhere more or less continuous with the stroma outwardly, and going over gradually into a hyaline, filamentous layer within; composed of rather thin-walled, angular, slightly compressed cells up to 15  $\mu$  long and ca. 5  $\mu$  thick. Ostioles cylindrical or narrow funnel-shaped, straight in the solitary perithecia, converging when the perithecia are in groups, 100–150  $\mu$  long, 70–100  $\mu$  broad, pale yellow-brown, protruding very slightly from the stroma, entire; traversed by a pore which is lined with hyaline periphyses. Asci 8-spored, oblong-clavate to oblong, rounded above, narrowing gradually or rather suddenly below into a short foot, 35–50  $\times$  8–10  $\mu$ . Spores distichous, hyaline, 3-septate, oblong to sub-fusoid, usually tapering somewhat to the rounded ends, 10–12  $\times$  2.5–3  $\mu$ ; constricted more or less at the middle septum and separating readily into two segments.

on stems of plant undet., Trigaartspoort, Pretoria Distr., *Bottomley* and *Doidge*, 31074.

***Calospora aurasiaca* (Fahr.) Sacc.**

The fungus recorded as this species on oak branches, (2, p. 41) is *Pseudovalsa longipes* (Tul.) Sacc., see *Bothalia* 4 (1941) p.

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**LATIN DIAGNOSES OF NEW SPECIES.**

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***Calospora Bottomleyae* Doidge nov. sp.**

Stromata sparsa v. in greges elongatos irregulares laxe disposita, primitus in corticem immersa, dein erumpentia atra, leniter convexa, ambitu elliptica, usque 1.5 mm. longa: inferne pro maxima parte tantum e reliquis substrati parum mutatis constantia, superne crusta atro-brunnea sat carbonacea ostiolis pertusa praedita. Perithecia 1–5 in quoque stromate, solitaria v. laxe lineare v. circinatim ordinata, globosa, plus minus depressa, 180–280  $\mu$  diam., 150–200  $\mu$  alta, superne in ostiola vix prominula subito attenuata; pariete ca. 12–20  $\mu$  crasso, e pluribus stratis cellularum leniter compressarum usque 15  $\mu$  long. et 5  $\mu$  lat. pellucide brunnearum composito. Asci octospori, oblongo-clavati, antice rotundati, breviter pedicellati, 35–50  $\times$  8–10  $\mu$ . Sporae distichae, hyalinae, 3-septatae, oblongae v. sub-fusoidae, ad septum primum medium constrictae, utrinque obtusae, 10–12  $\times$  2.5–3  $\mu$ .

Hab. in caulibus ignotis, Trigaartspoort, leg. *Bottomley* et *Doidge*, 31074.

***Diatrype auristroma* Doidge nov. sp.**

Stromata plerumque aggregata, primitus peridermio tecta deinde peridermio deciduo plus minus libera, ambitu orbicularia vel elliptica, pulvinata, 1–6 mm. longa, 1–1.5 mm. lata, ad superficiem atro-brunnea parenchymatice e cellulis 3–5  $\mu$  metientibus composita, intus aurea ad auranteo-brunnea. Perithecia omnino immersa, 5–30 in quoque stromate, conferta, monosticha v. irregulariter sub-disticha, ovata v. e mutua pressione irregularia, 450–900  $\mu$  alta, 220–450  $\mu$  lata, superne in ostiola crassa vix prominula 120–180  $\mu$  longa attenuata; pariete 10–12  $\mu$  crasso, obscure brunneo, e pluribus stratis cellularum 10–12  $\mu$  metientibus composito. Asci numerosi, octospori, clavati, antice rotundati et leniter incrassati, postice in stipitem tenuem longum hyalinum gracilem attenuati, p. sp. 30–36  $\times$  5–6  $\mu$ . Sporae distichae, allantoideae, utrinque rotundati, sub-hyalinae, in cumulo ochraceae, 6–8.5  $\times$  1.5–1.75  $\mu$ .

Hab. in ramulis emortuis *Xymalos monosporae* Baill., in silvis Marwaqa prope Bulwer, leg. *Morgan* et *Doidge*, 31073.



**Diatrype conferta** Doidge nov. sp.

Stromata sparsa v. aggregata, primitus peridermio tecta, mox erumpentia, atra, carbonacea, crasse verruciformia vel pulvinata, ambitu rotundata v. elliptica, 1–3 mm. diam., tunc haud raro in greges parvos connata et confluentia: crusta exterior 30–90  $\mu$  crassa atra opaca, e cellulis atro-brunneis ca. 2.5–4  $\mu$  metientibus composita, intus sub crustam strato albo praedita, sub peritheciis luteo-brunnea. Perithecia numerosa (usque 30) in quoque stromate, conferta, disticha v. monosticha, ovata v. e mutua pressione irregularia, 250–400  $\mu$  diam., usque 550  $\mu$  alta, superne in ostiola vix vel distincte prominula 150–300  $\mu$  longa attenuata: pariete sub-opace atro-brunneo, 18–30  $\mu$  crasso, e pluribus stratis cellularum compressarum composito. Asci numerosissimi clavati octospori, antice rotundati et leniter incrassati, postice in stipitem longum gracilem attenuati, p. sp. 40–50  $\times$  7.5–8  $\mu$ . Sporae distichae, allantoideae, sub-hyalinae in cumulo pallide flavo-brunneolae, 10–15  $\times$  2.5–3  $\mu$ .

Hab. in ramis emortuis ignotis, in silvis Xumeni prope Donnybrook, leg. Morgan et Doidge, 30420.

**Diatrype Doryalidis** Doidge nov. sp.

Stromata sparsa vel plus minus aggregata, primitus in cortice immersa dein plus minus erumpentia, strata exterior elevantia et disrumpentia laciniis ejus pro parte tecta, ambitu rotundata vel elliptica, 0.5–1 mm. diam.: crusta exterior 30–75  $\mu$  crassa, atro-brunnea subopaca, carbonacea, e cellulis 2.5–5  $\mu$  diam. composita. Perithecia plerumque 2–6 in quoque stromate, monosticha, saepe circulariter disposita, ovata v. oblonga, e mutua pressione saepe applanata, 300–450  $\mu$  diam., 450–500  $\mu$  alta, superne in ostiola cylindracea prominula 300–400  $\mu$  longa attenuata; pariete 20–35  $\mu$  crasso atro-brunneo, e pluribus stratis cellularum 2.5–5  $\mu$  metientibus composito. Asci numerosi octospori clavati, p. sp. 30–40  $\times$  5–6  $\mu$ , antice rotundati, postice in stipitem longum gracilem attenuati. Sporae distichae allantoideae continuae singulae sub-hyalinae, in cumulo flavo-brunneolae, 6–8  $\times$  1.75–2  $\mu$ .

Hab. in ramulis *Doryalidis rhamnoidis* (Burch.) Harv. in silvis, Knysna, leg. Bottomley, 31060.

**Diatrype Leonotidis** Doidge nov. sp.

Stromata sat equaliter per caulem sparsa, subinde gregaria, primitus in cortice immersa, dein plus minus erumpentia, strata exterior elevantia et disrumpentia laciniis ejus pro parte tecta, lateraliter firme cum peridermio connata. atra, pulvinata vel verruciformis, ambitu rotundata vel leniter elongata, 1–2.5 mm. diam.: crusta exterior ca. 50  $\mu$  crassa, carbonacea, e cellulis atro-brunneis 3.5–5  $\mu$  metientibus composita. Perithecia plerumque 3–5 vel usque 8 in quoque stromate, circulariter v. plus minus irregulariter disposita, globosa v. ovata, e mutua pressione saepe applanata, 300–400  $\mu$  diam., superne subito in ostiola crasse cylindracea haud vel vix prominula attenuata; pariete ca. 12–15  $\mu$  crasso e pluribus stratis cellularum compressarum composito. Asci numerosissimi 8-spori, clavati, p. sp. fusiformi 35–45  $\times$  6–8  $\mu$ , antice rotundati, postice in stipitem longum gracilem attenuati. Sporae distichae, allantoideae, continuae, pallide flavo-brunneolae, leniter curvatae, 10–12.5  $\times$  2–2.5  $\mu$ . Paraphyses hyalinae, filiformes.

Hab. in caulibus *Leonotidis* sp., Hlabini, Polela distr., leg. Doidge, 29821.

**Diatrype xumenensis** Doidge nov. sp.

Stromata longe lateque irregulariter sparsa, interdum solitaria sed plerumque plus minus aggregata, saepe lineas breviores vel longiores parallelas formantia, primitus peridermio tecta et tantum ad verticem per rimas erumpentia, deinde peridermio deciduo fere omnino libera, ambitu orbicularia vel elliptica, crasse verruciformia vel pulvinata, ca. 1 mm. diam., subinde omnino confluentia et tunc majora; ad superficiem opace atra vel atro-



brunnea carbonacea, parenchymatice e cellulis atro-brunneis ca.  $5-8\ \mu$  metientibus composita. Perithecia omnino immersa, 2-8 in quoque stromate, monosticha, ovata, e mutua pressione saepe applanata et irregularia,  $200-450\ \mu$  diam.,  $450-550\ \mu$  alta, superne in ostiola cylindracea plerumque leniter prominula fasciculatim conjuncta, indivisa vel tenuiter sulcata, attenuata: pariete ca.  $16-25\ \mu$  crasso, e pluribus stratis cellularum fere opace atro-brunnearum composito. Asci numerosissimi octospori, clavati, p. sp. ellipsoidei v. parum fusoides,  $40-45 \times 5.5-6.5\ \mu$ , antice rotundati, postice in stipitem tenuem longiusculum attenuati. Sporae distichae vel incomplete tritichae cylindraceae utrinque rotundatae, allantoideae curvatae continuae, sub-hyalinae in cumulo luteo-brunneolae,  $6-10 \times 2-2.5\ \mu$ .

Hab. in ramis emortuis in silvis Xumeni, prope Donnybrook, leg. Morgan et Doidge, 28919.

**Diatrypella Morganae** Doidge nov. sp.

Stromata longe lateque irregulariter sparsa, plerumque solitaria, interdum in greges minutos crescentia, ambitu plus minus rotundata, pulvinata,  $1-2.5\ \text{mm.}$  diam., semper peridermio tecta et tantum cum ostiolis erumpentia: contextu stromati intramatrici parvissime evoluto, pro maxima parte e substrati partibus plus minus mutatis et cellulis minutis sub-hyalinis vel dilute flavo-brunneolis constante. Perithecia monosticha 3-7 in quoque stromate, omnino immersa, globosa v. ovata, sive laxe stipata sive plus minus dense aggregata e mutua pressione applanata,  $250-500\ \mu$  diam., superne subito in ostiola crasse cylindracea convergentia,  $150-200\ \mu$  crassa, plerumque leniter prominula, ad marginem subinde tenuiter sulcata et nitidula attenuata: pariete inferne et ad latera  $20-30\ \mu$  crasso, e pluribus stratis cellularum compressarum pellucide atro-brunnearum ca.  $10-15\ \mu$  metientibus composito. Asci numerosi polyspori, cylindracei vel clavati, subsessiles v. breviter stipitati,  $100-125 \times 12-15\ \mu$ . Sporae allantoideae continuae, utrinque rotundatae, pallide luteo-brunneolae, in cumulo fere rufo-brunneae,  $10-16 \times 2.5-4\ \mu$ .

Hab. in ramis emortuis, Hlabini, Polela distr., leg. Morgan et Doidge, 29820.

**Diatrypella natalensis** Doidge nov. sp.

Stromata sive irregulariter sparsa, sive in greges minutos v. majores vel in lineas breviores saepe densos crescentia, ambitu plus minus rotundata, usque  $1\ \text{mm.}$  diam., vel elliptici ca.  $3 \times 1\ \text{mm.}$ , primitus peridermio tecta, deinde plus minus libera, atra, convexa, pulvinata; ad superficiem opace atra, carbonacea, parenchymatice e cellulis pellucide atro-brunneis  $6-8\ \mu$  metientibus composita. Perithecia 7-15 in quoque stromate, omnino immersa, globosa v. ovata, e mutua pressione saepe irregularia,  $250-400\ \mu$  diam.,  $300-500\ \mu$  alta, superne in ostiola breviuscula crasse cylindracea leniter prominula ad marginem 3-5-sulcata et nitidula attenuata; pariete obscure brunneo  $12.5-25\ \mu$  crasso, e pluribus stratis cellularum fortiter compressarum composito. Asci numerosi, polyspori, clavati, recti v. curvati, ad apicem rotundati, postice in stipitem gracilem hyalinem attenuati, p. sp.  $80-100 \times 12.5-15\ \mu$ . Sporae allantoideae continuae, plus minus curvatae, utrinque rotundatae, sub-hyalinae, in cumulo luteo-brunneolae,  $5-7.5 \times 1-1.2\ \mu$ . Paraphyses non visae.

in caulibus *Citri nobilis* Lour., Umtwalumi, Natal, leg. Wayne, 21006.

**Diatrypella pretoriensis** Doidge nov. sp.

Stromata in greges majores irregulares densiore crescentia, plerumque discretata, ambitu plus minus rotundata, usque  $1\ \text{mm.}$  diam., primitus peridermio tecta deinde erumpentia, plus minus convexa pulvinata; crusta exteriore  $50-60\ \mu$  crassa, nonnunquam usque  $75\ \mu$ , atra, carbonacea. Perithecia 2-12 in quoque stromate, monosticha, per ratione laxe stipata, ideoque sat regulariter globosa v. ovata,  $400-500\ \mu$  diam., superne in ostiola breviter cylindracea vix prominula subito attentuata; pariete atro-brunneo sub-opaco, e stratis

pluribus cellularum compressarum ca. 4-6  $\mu$  metientium composito. Asci numerosi, poly-sporei, sporis minutis dense stipati, antice rotundati, postice in stipitem gracilem attenuati, p. sp. 40-60  $\times$  10-12.5  $\mu$ . Sporae allantoideae, sub-hyalinae, in cumulo pallide luteo-brunneolae, 2.5-4  $\times$  1  $\mu$ , rarius usque 5  $\mu$  longae.

Hab. in radicibus *Populi* sp., De Beers Rust, prope Pretoria, leg. Doidge, 31072.

**Eutypella Acaciae** Doidge nov. sp.

Stromata in cortice late effusa, usque ad 8 cm. longa et 2 cm. lata, circa acervulos vix elevata, fere tantum cum ostioli fasciculatim coalitis per corticis rimas erumpentia; inferne pro maxima parte tantum e reliquis substrati parum vel leniter mutatis constantia, superne crusta carbonacea opace atro-brunnea ostioli pertusa praedita. Perithecia monosticha, plerumque 1-5 aggregata, globosa v. ovata, e mutua pressione saepe leniter applanata, 330-550  $\mu$  diam., 400-520  $\mu$  alta, superne subito in ostiola crasse cylindracea plerumque fasciculatim conjuncta et connata sulcis 3-5 tenuibus praedita attenuata: pariete opace atro-brunneo, inferne et ad latera ca. 20  $\mu$  crasso, e pluribus stratis cellularum composito. Asci numerosissimi, clavati, 8-sporei, p. sp. ellipsoidea vel fusioidea 35-40  $\times$  6-6.5  $\mu$ , antice rotundati, postice in stipitem longum gracilem attenuati. Sporae distichae v. sub-tristichae, pallide olivaceae, continuae allantoideae utrinque rotundatae, plus minus curvatae, 8-15  $\times$  2-2.5  $\mu$ .

Hab. in ramis emortuis *Acaciae ataxacanthae* D.C., Kromrivier, Rustenburg distr., leg. Doidge et Bottomley, 30476.

**Eutypella Lycii** Doidge nov. sp.

Stromata sparsa vel in series irregulares disposita, minuta, atra, e basi circulari conico-truncata, in cortice immersa ostioli tantum prominulis, lateraliter firme cum peridermio connata, usque ad 1.5 mm. diam.; inferne pro maxima parte tantum e reliquis substrati parum mutatis constantia, superne crusta sat carbonacea ostioli pertusa, parenchymatice e cellulis fere opace atro-brunneis 4-6  $\mu$  metientibus praedita. Perithecia monosticha, 1-7 raro 8-13 in quoque stromate, circulariter disposita, globosa v. ovata e mutua pressione interdum leniter applanata, 350-450  $\mu$  diam. 400-475  $\mu$  alta, superne subito in ostiola sub-cylindracea curvata sulcis 3-5 praedita attenuata: pariete inferne et ad latera ca. 25  $\mu$  crasso, e pluribus stratis cellularum compressarum pellucide atro-brunnearum composito. Asci numerosissimi, 8-sporei, clavati v. sub-fusiformi, 35-40  $\mu$  longi, p. sp. 25-28  $\times$  3.75-5  $\mu$ , antice rotundati postice in stipitem gracilem attenuati. Sporae distichae allantoideae continuae utrinque rotundatae, sub-hyalinae in cumulo pallide olivaceae, 5-6.5  $\times$  1  $\mu$ .

Hab. in ramulis *Lycii echinati* Dun., Aliwal North, leg. Pienaar, 2094.

**Valsaria natalensis** Doidge nov. sp.

Stromata longe lateque irregulariter sparsa, numerosissima et magnam ramorum partem obtegentia, solitaria irregulariter circularia usque 1 mm. diam. vel in greges irregulares crescentia, tunc haud raro connata et confluentia, immersa v. pustulatum erumpentia, lateriliter firme cum laciniis peridermii connata: inferne et ad latera pro maxima parte tantum e reliquis substrati parum vel leniter mutatis constantia, superne parenchymatice e cellulis pellucide brunneis 5-6  $\mu$  metientibus composita. Perithecia monosticha, in stromate omnino immersa plerumque 1-4 in quoque stromate, globosa vel late ovata vel e mutua pressione irregularia, 200-450  $\mu$  diam., superne in ostiola cylindracea v. anguste conica 75-100  $\mu$  lata attenuata: pariete inferne et ad latera ca. 25-30  $\mu$  crasso, e pluribus stratis cellularum valde compressarum pellucide brunnearum composito, intus subito in stratum hyalinum concentricum fibrosum transeunte. Asci numerosi clavati, antice rotundati, postice in stipitem longum gracilem ad basim filamentosum attenuati, in toto 100-150  $\mu$  longi, p. sp. 50-72.5  $\times$  11-12.5  $\mu$ . Sporae distichae, brunneae, 1-septatae,

fusoideae vel ellipsoideae, ad septum constrictae utrinque obtuse conicae v. rotundatae,  $12.5-16 \times 5.5-6.6 \mu$ , cellulis ut plurimum aequalibus vel subaequalibus, subinde autem superiore paullo brevior sed latiore. Paraphyses numerosae, hyalinae, filiformes, ca.  $1 \mu$  crasso.

Hab. in ramis emortuis *Solani auriculati* Ait., in silvis Xumeni, prope Donnybrook. leg. Morgan et Doidge 28931, 30373.

#### LITERATURE CITED.

1. Berlese, A. N. Incones Fungorum ad usum Sylloges Saccardianae, Vol. III (1900).
2. Doidge, E. M. and A. M. Bottomley. A revised list of plant diseases occurring in South Africa Botanical Survey of South Africa, Memoir No. 11 (1931).
3. Ellis, J. B. and B. M. Everhart. The North American Pyrenomycetes (1892).
4. Hopkins, J. C. F. A preliminary list of Rhodesian Fungi. Trans. Rhod. Sc. Ass. 35 (1938) pp. 87-127.
5. Jenkins, Anna E. Brown. Canker of roses caused by *Diaporthe umbrina*. Jour. Agric. Res. 15 (1918) pp. 593-599.
6. Kalchbrenner, C. and M. C. Cooke. South African Fungi. Grevillea IX (1880) pp. 17-34 and 45-56.
7. Theissen, F. Mykologische Mittheilungen, III. Kurze Darstellung der Gattung Pseudothis. Ann. Myc. 16 (1918) pp. 179-183.
8. Sydow, H. Beschreibungen neuer südafrikanischer Pilze VII. Ann. Myc. 37 (1939) 181-196.
9. von Höhnelt, F. Mykologische Fragmente CCLXII. Über die allantoidsporigen Sphaeriaceen. Ann. Myc. 16 (1918) pp. 127-132.
10. Wehmeyer, Lewis E. A biologic and phylogenetic study of the stromatic Sphaeriales. Amer. Jour. Bot. 13 (1926) pp. 575-643.
11. Wehmeyer, Lewis E. The genus *Diaporthe* Nitschke and its segregates. Univ. of Michigan Studies, Science Series, Vol. IX (1933) 349 pp.
12. Wolf, Frederick A. The perfect stage of the fungus which causes melanose of Citrus. Jour. Agric. Res. 33 (1926) pp. 621-625.

#### EXPLANATION OF PLATES.

Except the reproduction of Berlese's drawings. Plates 4-15 are photographs of sections through the stromata of the species indicated; the magnification is the same in each case,  $\times 224$ .

- Plate 1.—*Calosphaeria princeps* Tul. a. Perithecia on bark of *Prunus armeniaca* a. ( $\times 7$ ); b. detail from a. ( $\times 14$ ).
- Plate 2.—a. *Diatrype auristroma*, stromata on bark; b. *Diatrype xumenensis*. Both ( $\times 7$ ).
- Plate 3.—a. *Diatrypella Agaves*, stromata on stem; b. *Diatrype caulina*; c. *Peroneutypella cylindrica*. the ostioles of the perithecia and the sterile emergences can be detected; all ( $\times 7$ ).
- Plate 4.—a. *Erostella quaternarioides* from Berlese's drawing; b. *Valsa leucostoma*.
- Plate 5.—*Peroneutypella cylindrica*, a. from collection 28918; b. from 30164.
- Plate 6.—a, b. *Peroneutypella infinitissima*, from type collection; c. *Eutypella Acaciae*.
- Plate 7.—a. *Eutypella Lycii*; b, c. *Eutypella stellulata*, b. Medley Wood's collection; c. from Rhodesian material; d, e. *Eutypella citricola*; d. material from Philippines; e. from Natal collection.
- Plate 8.—a. *Eutypella MacOwani*; b, c. *Eu. Doidgeae*; b. from type collection 30378.
- Plate 9.—a. *Diatrype Doryalidis*; b. *D. xumenensis*; c. *D. caulina*; d. *D. Leonotidis*.
- Plate 10.—*Diatrype MacOwaniana*, a. from Berlese's drawing of *D. Bona-spei*; b. from *MacOwan* 1264.
- Plate 11.—*Diatrype auristroma*, a. stroma with contracted, sterile base; b. stroma with extended base.
- Plate 12.—*Diatrype caminata*, a. from Berlese's drawing; b. from recent collection.
- Plate 13.—a, b. *Diatrype conferta*; c. *Diatrypella Morganae*.
- Plate 14.—a. *Diatrypella oligostroma*; b. *D. Agaves*; c. *D. natalensis*.
- Plate 15.—a, b. *Diatrypella pretoriensis*; c. *Pseudothis Pterocarpi*; d. *Valsaria Eucalypti*; e. *Valsaria natalensis*.



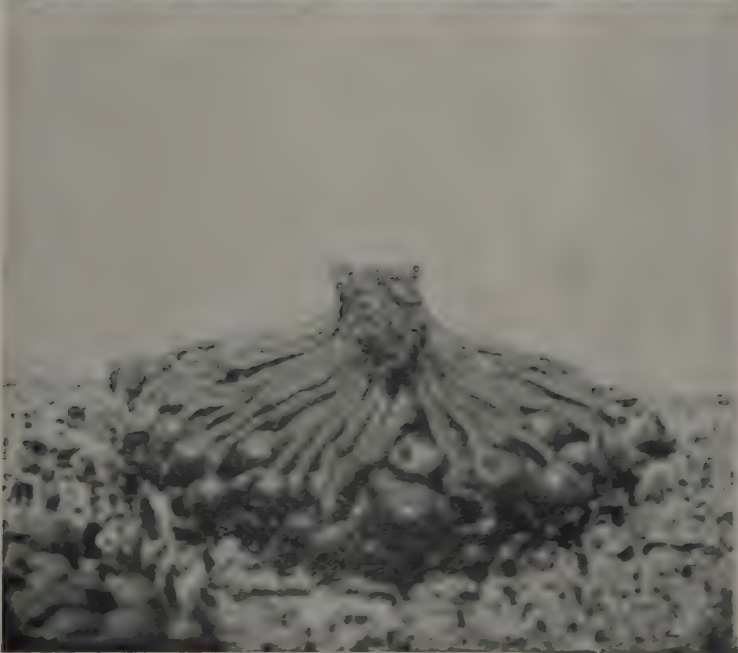
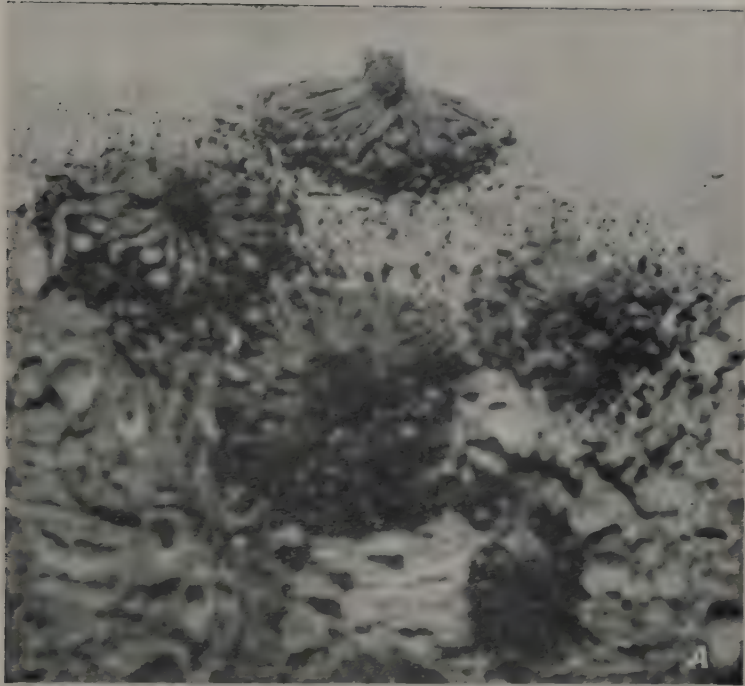


PLATE I.  
*Calosphaeria princeps.*



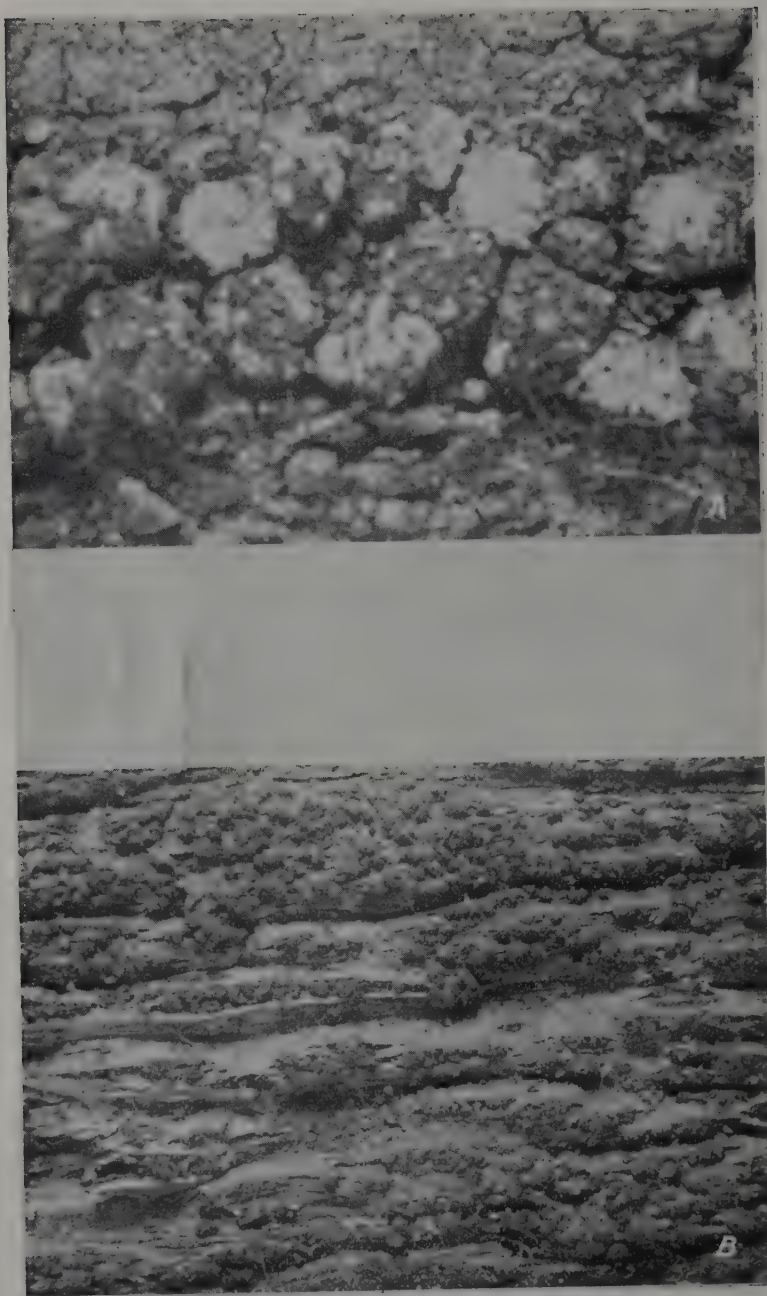


PLATE 2.

- A. *Diatrype aurristroma*.  
B. *Diatrype xumenensis*.

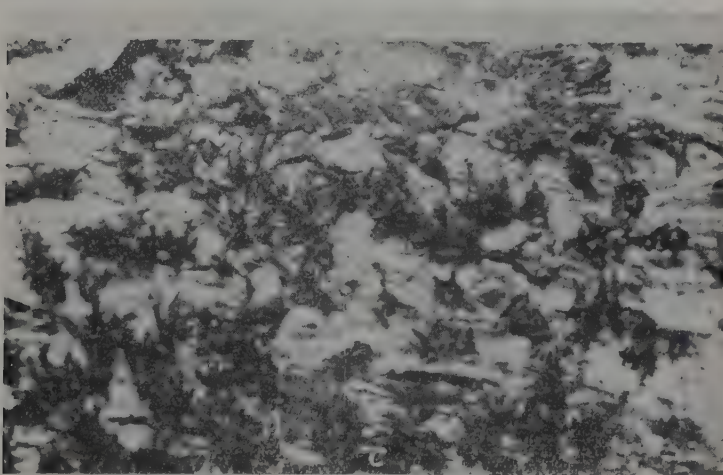
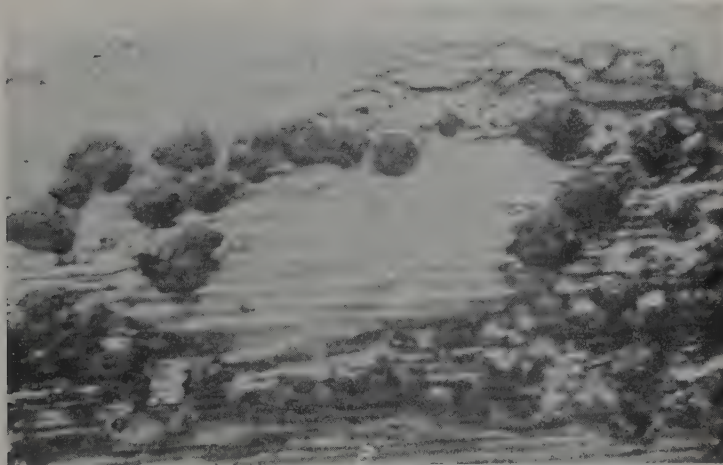
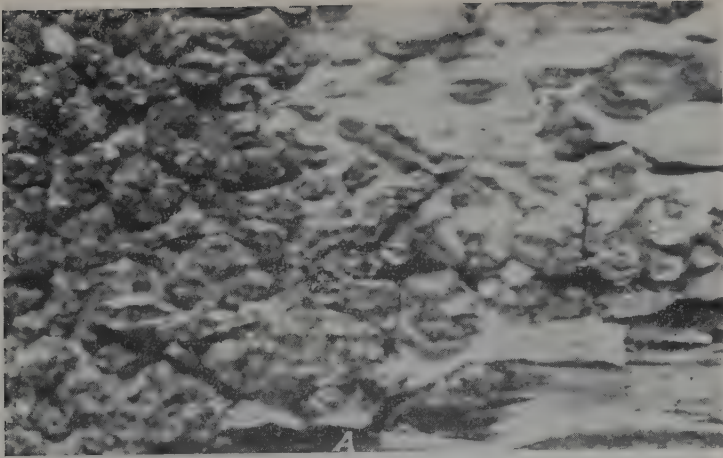


PLATE 3.

A. *Diatrypella Agaves*. B. *Diatrype caulina*. C. *Peroneutypella cylindrica*.

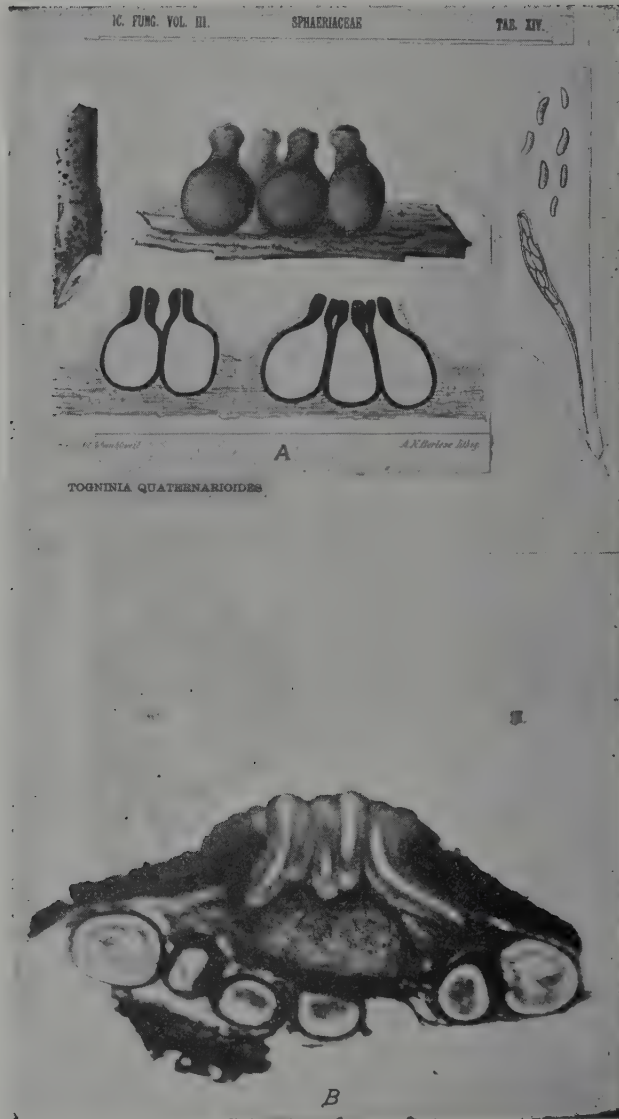


PLATE 4.

*A. Erorella quaternarioides.**B. Vala leucostoma.*

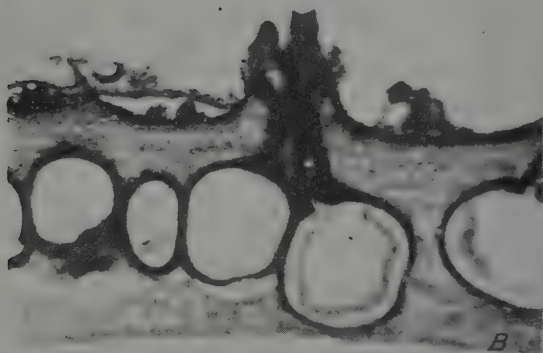
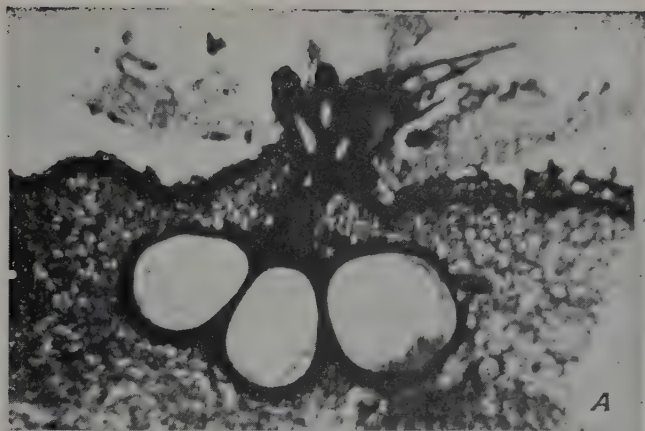


PLATE 5.—*Peroneutypella cylindrica*.



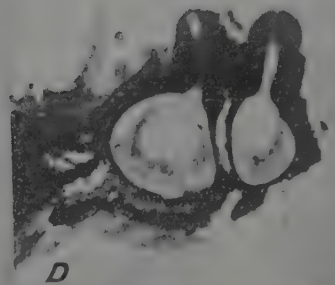
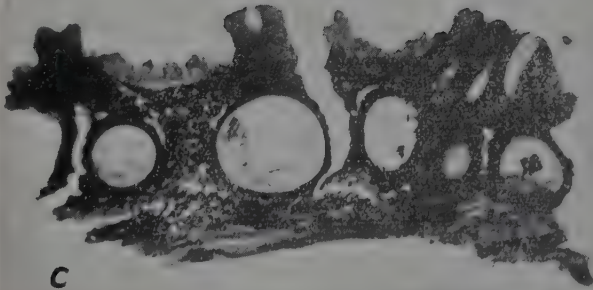
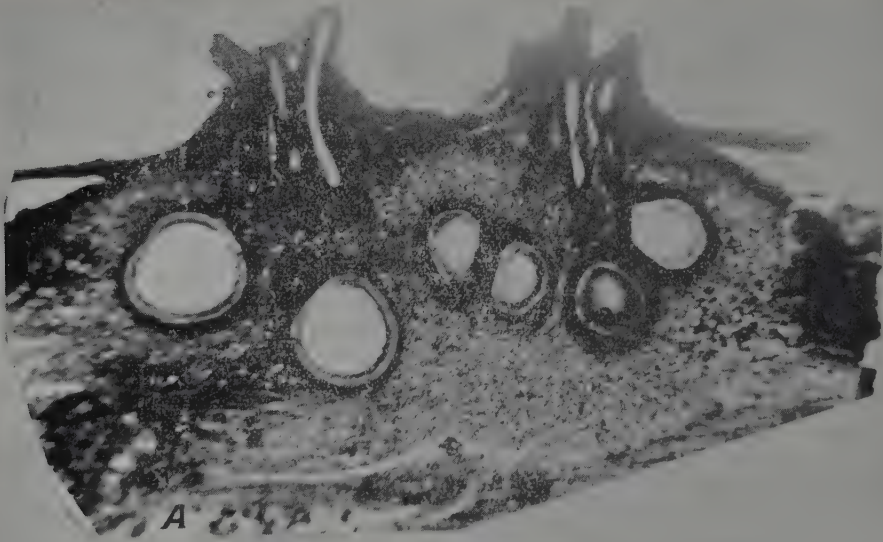


PLATE 6.

A., B. *Peronentypella infinitissima*.C., D. *Eutypa transvaalensis*.

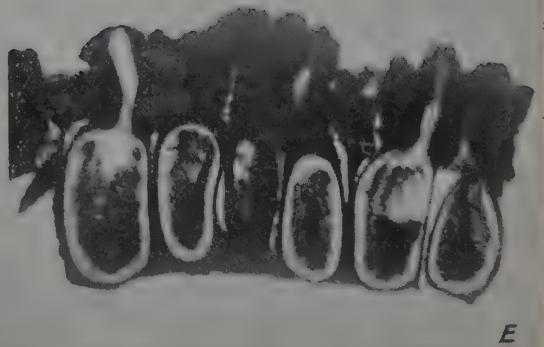
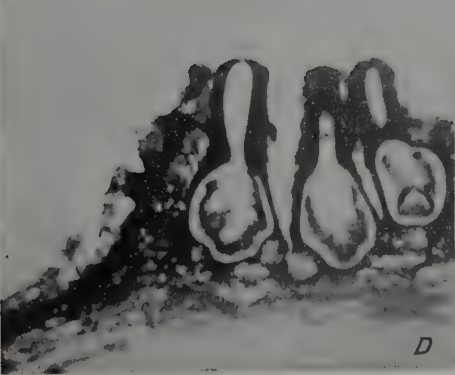
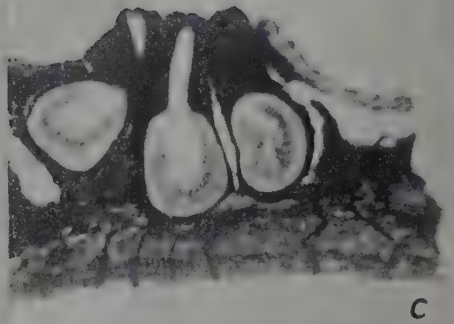
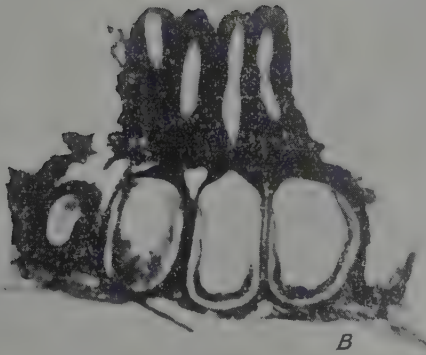
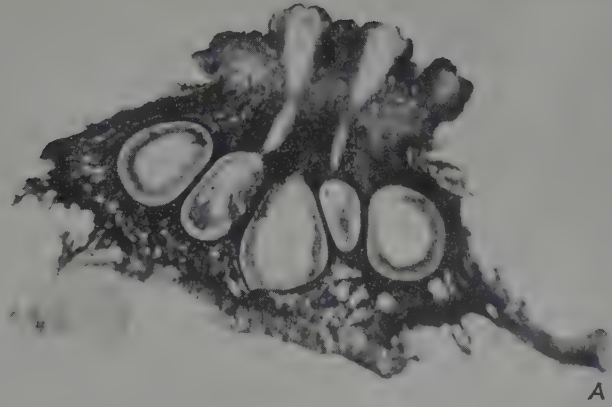
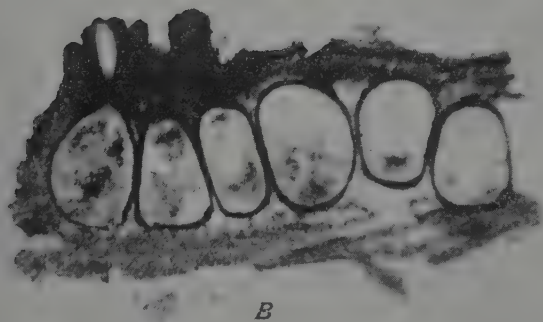
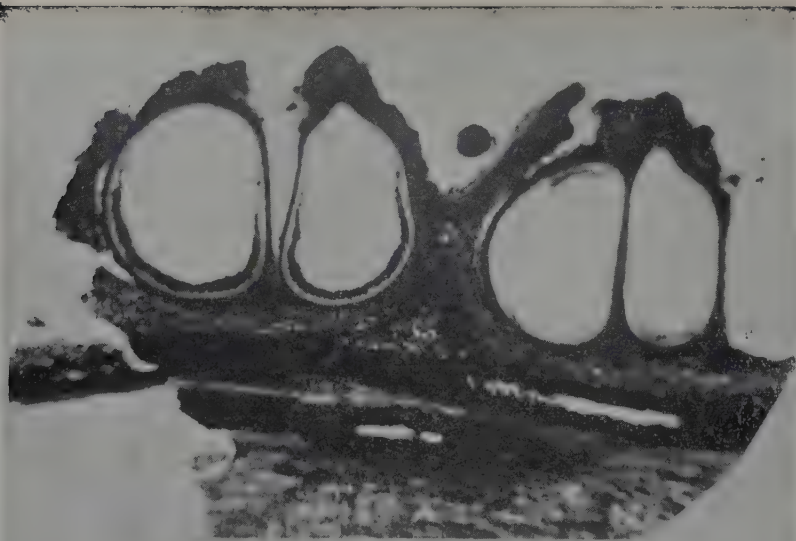
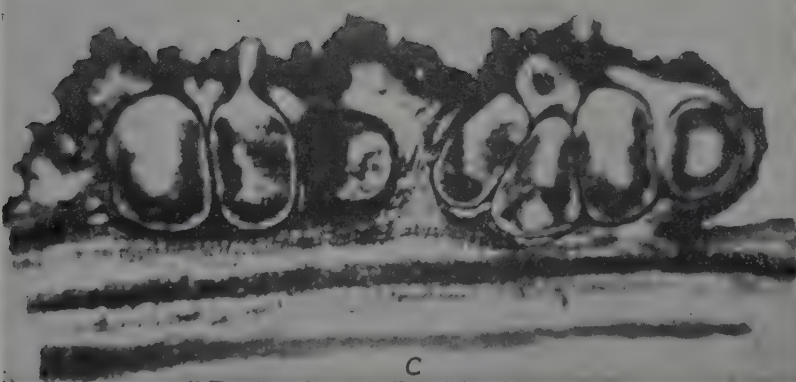


PLATE 7.

A. *Eutypella Lycii*. B., C. *Eutypella stellulata*. D., E. *Eutypella citricola*.



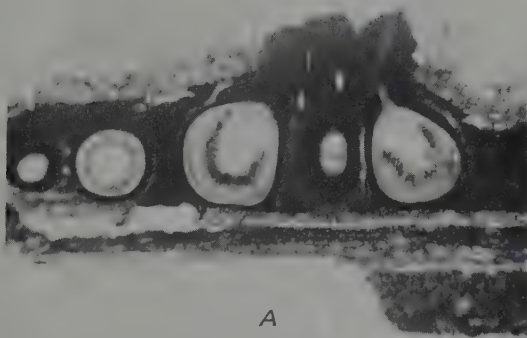
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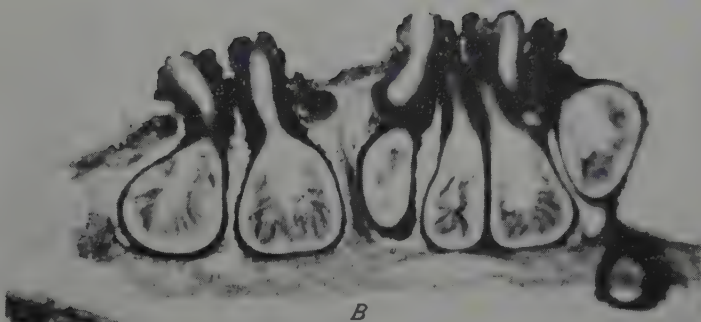
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## PLATE 8.

A. *Eutypella MacOwani*. B., C. *Eutypella Doidgeae*.



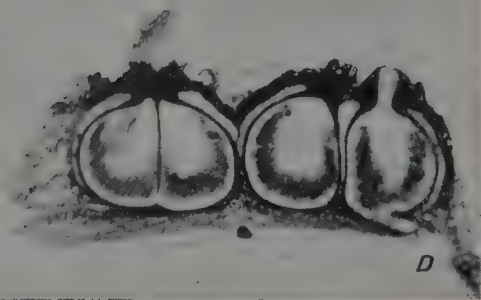
A



B



C



D

## PLATE 9.

A. *Diatryse Doryalidis*.  
C., *D. caulina*.

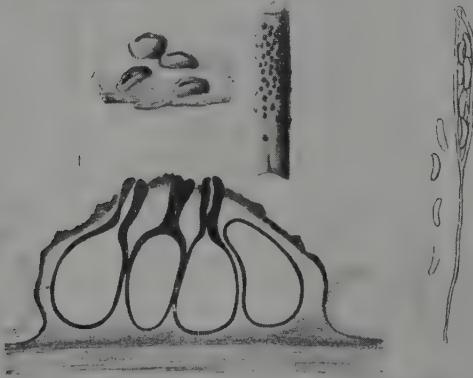
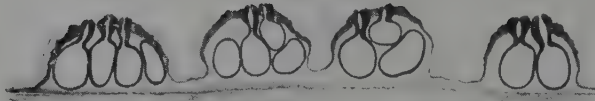
B. *Diatrype Xumenensis*.  
D., *D. Leonotidis*.



IC. FUNG. VOL. III

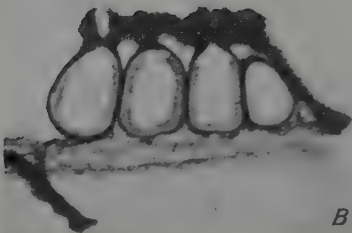
SPHAERIACEAE

TAB. CVI



D. DONAE SPEI

A



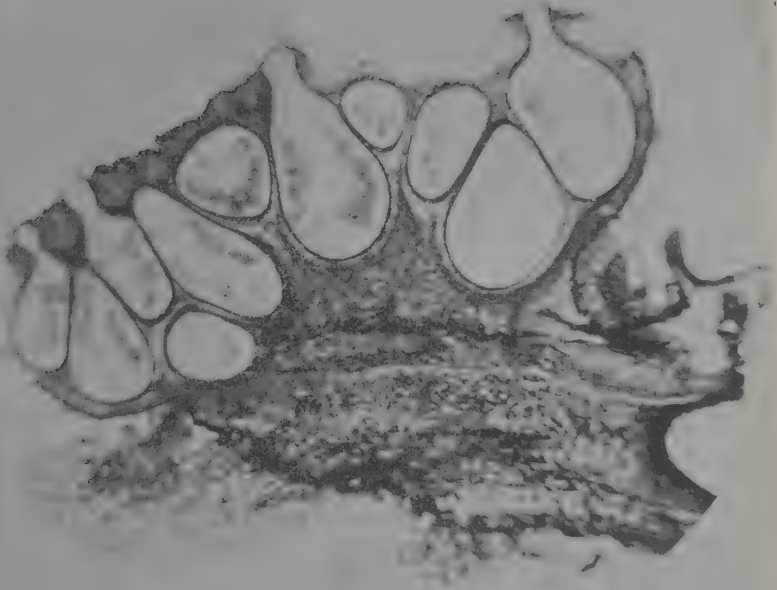
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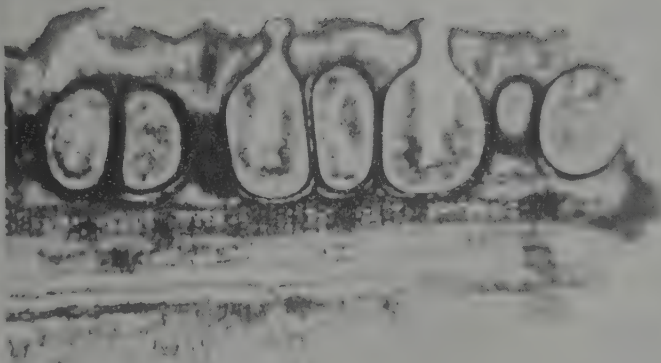
C

## PLATE 10.

A. Berlese's Drawings. *D. Bona Spei*.B., C.—*D. MacOwaniana*.



A



B

PLATE 11.  
*Diatrype auristroma.*

IC. FUNG. VOL. III

SPHAERIACEAE

TAB. CXL

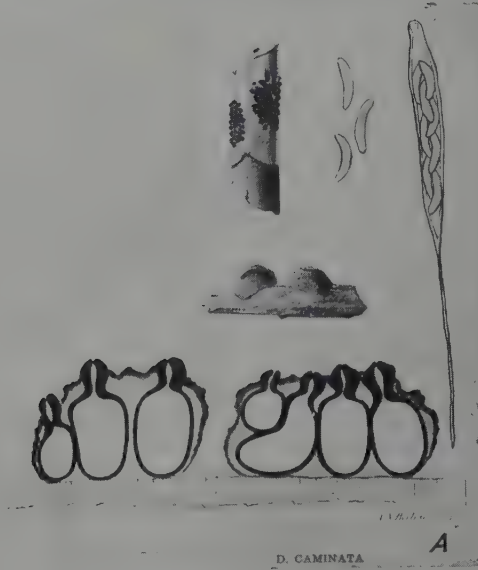
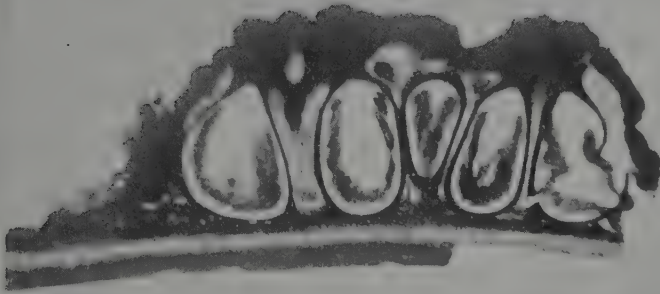


PLATE 12.

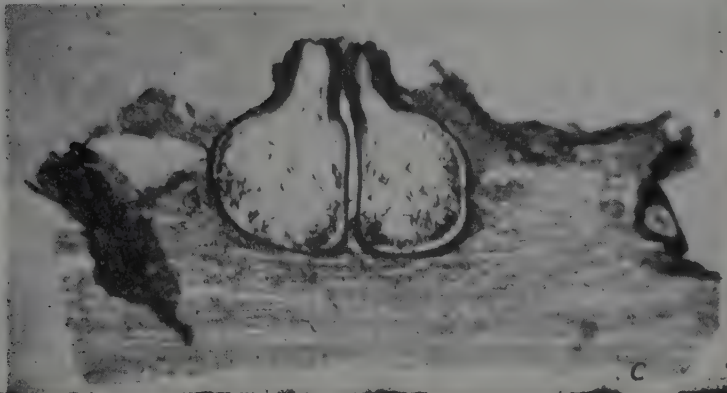
*D. Caminata.*



A



B

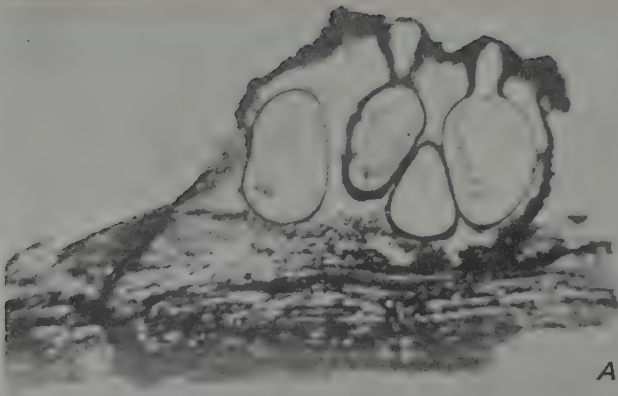


C

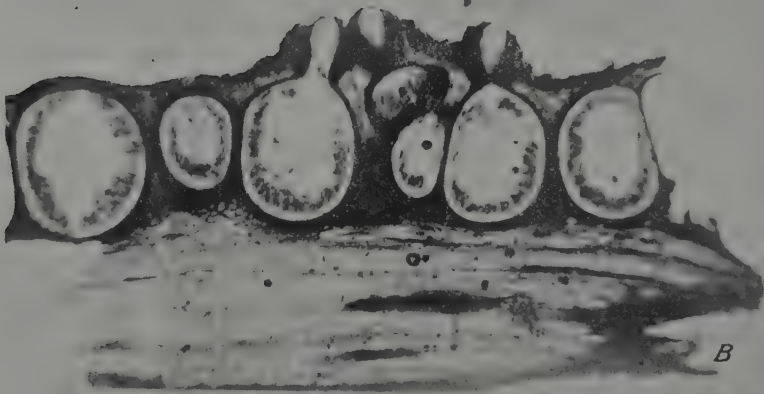
## PLATE 13.

A., B. *Diatrype conferta*.C. *Diatrypella Morganae*.

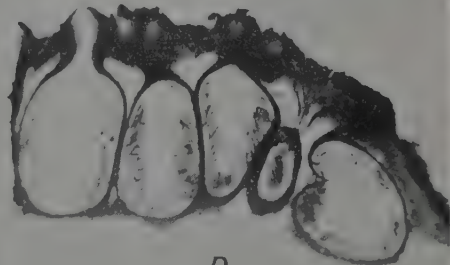
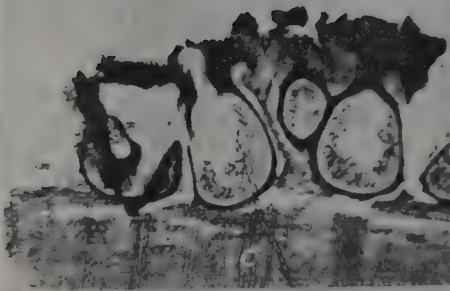




A



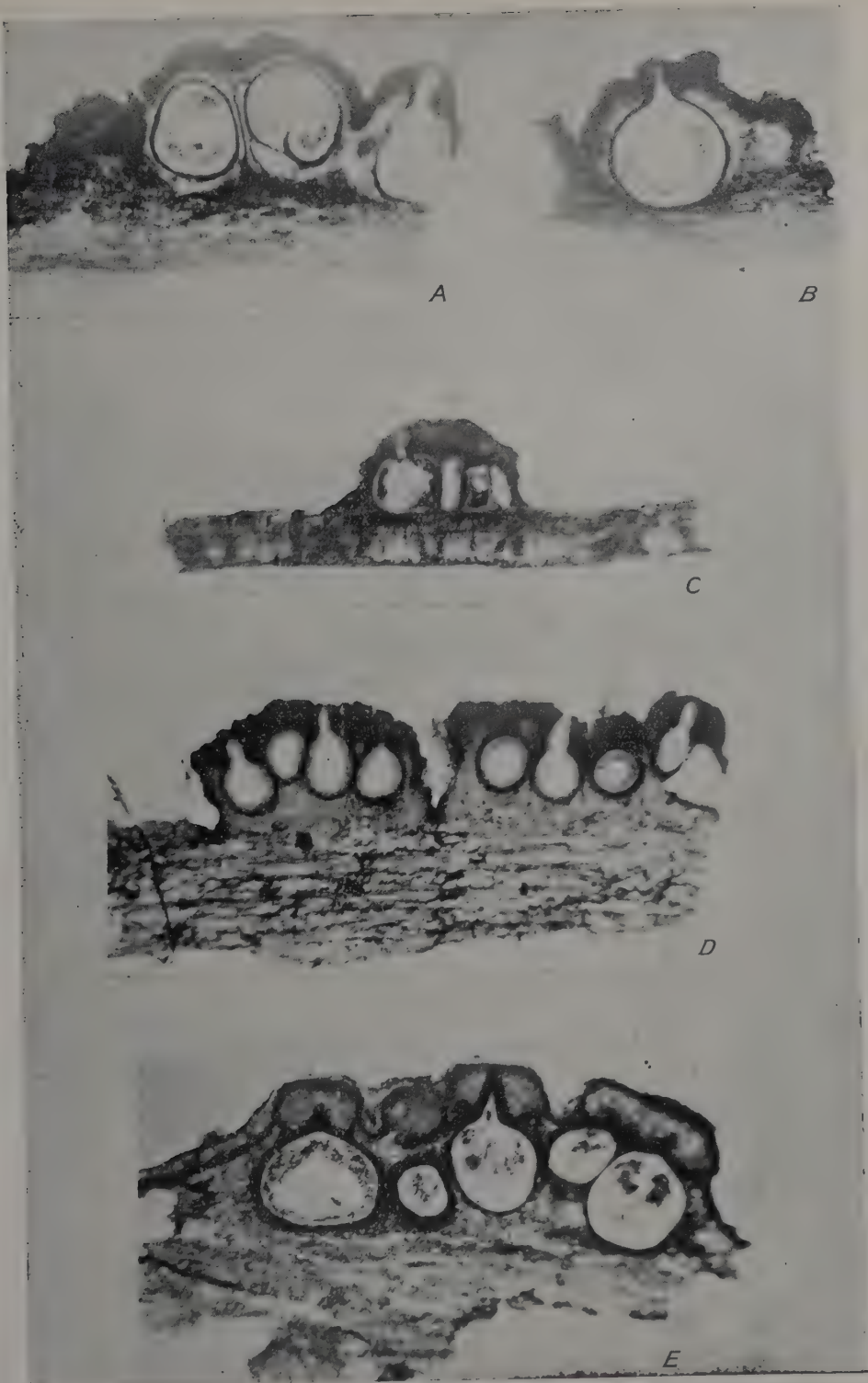
B



D

## PLATE 14.

A.—*Diatrypella oligostroma*.B.—*D. Agaves*.C,, D.—*D. Natalensis*.



[PLATE 15.

A., B.—*Diatrypella pretoriensis*.  
 D.—*Valsaria Eucalypti*.

C.—*Pseudothus Pterocarpi*.  
 E.—*Valsaria natalensis*.



# AN ACCOUNT OF THE SOUTH AFRICAN MATERIAL OF *ARISTIDA* LINN. IN CERTAIN EUROPEAN AND SOUTH AFRICAN HERBARIA.

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By

H. G. Schweickerd.

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## Scope of the Present Paper.

Until the time of publication of Henrard's classical Revision and Monograph of the genus *Aristida* L., great difficulty was experienced in naming critically any South African material of this genus. As Henrard was in a position to examine only a limited number of South African specimens owing to the great amount of time which the examination of such a large genus necessarily involved, the author of the present paper undertook to align and name up critically all the material in the South African Herbaria. He, furthermore, extended his original intention and later on included the South African material deposited in most of the Herbaria enumerated below. In the course of these investigations several difficulties were encountered. Several doubtful points however have also been settled. Where necessary and desirable the specific descriptions as given by Henrard have been modified to include the very wide range of material (about 6,000 sheets) studied. The sequence of the enumerated species is not strictly according to the plan as adopted by Henrard; his work, however, has formed a basis which the present author has merely attempted to enlarge upon.

## Acknowledgments.

My sincere thanks are due to the Directors of the various Herbaria mentioned below for the many facilities afforded in the carrying out of these investigations. Special thanks are due to Mr. C. E. Hubbard of Kew and Prof. Dr. R. Pilger of Berlin-Dahlem, for their kind assistance and suggestions.

## Herbaria Consulted.

The various Herbaria in which the numerous specimens cited are deposited, have been indicated by the bracketed abbreviations following such specimens. These indices refer to the respective Herbaria enumerated below.

- A..... Albany Museum, Grahamstown.
- B..... Botanisches Museum, Berlin-Dahlem.
- BH..... Bolus Herbarium, Cape Town.
- BM..... British Museum (Natural History), London.
- D..... Natal Herbarium, Durban.
- G..... Conservatoire Botanique, Geneve.
- GU..... Grey University College, Bloemfontein.
- K..... Royal Botanic Gardens, Kew.
- L..... Rijksherbarium, Leiden.



LG.....	Herb. Trinius, Leningrad.
Mc.....	McGregor Museum, Kimberley.
N.....	National Herbarium, Pretoria.
O.....	Fielding Herbarium, Oxford.
P.....	Museum National d'Histoire Naturelle, Paris.
S.....	South African Museum, Capetown.
Sreg.....	Regional Herbarium, University, Stellenbosch.
St.....	University of Stellenbosch.
T.....	Transvaal Museum, Pretoria.
U.....	University of Cape Town.
V.....	Naturhistorisches Museum, Wien.
W.....	U.S. National Herbarium, Smiths. Inst., Washington.
WR.....	University of Witwatersrand, Johannesburg.
Z.....	Botanisches Museum, Zürich.

In addition to the above, the following abbreviations are used throughout:—

Henrard Crit. Rev... A Critical Revision of the Genus *Aristida* by J. Th. Henrard in Mededeelingen van 's Rijksherbarium Leiden Nos. 54 (1926), 54A (1927), 54B (1928), 54C (1933).

Henrard Monogr..... A Monograph of the Genus *Aristida* by J. Th. Henrard in Mededeelingen van 's Rijksherbarium Leiden Nos. 58 (1929), 58A (1932), 58B (1933).

### The Subdivisions of the Genus.

Henrard's brilliant Revision and Monograph of the genus has shown that the species readily fall into seven sections. The species of any one particular section form with but a few exceptions, a fairly homogeneous group. These sections are based solely on organographic characters of the inflorescence, i.e. the spikelet. So far the existing sections of the genus have proved to be quite adequate.

Theron in Fedde, Rep. 40. I. ff. (1936) has published the results of an anatomical study of the leaves of many South African species of *Aristida*. He has drawn up four anatomical groups and cites the species constituting these groups. His first group consists of species typical of § *Stipagrostis* and § *Schistachne*. The second group consists of species belonging to §§ *Stipagrostis*, *Chaetaria* and *Arthratherum*. The third group is formed by elements belonging to §§ *Stipagrostis*, *Arthratherum*, *Chaetaria* and *Pseudarthratherum*. The fourth group consists of members belonging to the § *Stipagrostis*.

All the anatomical groups except the fourth are thus composed of elements taken from two or more organographic sections and thus if considered from an organographic point of view these groups are extremely heterogeneous in constitution. If the leaf anatomy leads one to place together in one group such diverse elements as *A. geminifolia*, *A. bipartita*, *A. barbicollis* and *A. spectabilis*, all of which are organographically very distinct from each other, a classification based on leaf anatomy is highly artificial and shows no advantages over a natural classification based solely on organographic characters. Theron's fourth anatomical group consisting of *A. lanipes*, *A. gonatostachys*, *A. subacaulis* and *A. Hermannii* is the only one acceptable since its constituents form a fairly homogeneous unit both from an anatomical and organographic point of view. It is interesting to note that the anatomical structure of the leaves in *A. capensis* and *A. sericans* bear very great resemblance to each other. These species organographically likewise show a great deal of convergence. The recently described *A. capensis* Thunb. var. *Dieterleniana* mihi superficially resembles *A. sericans* Hack. so closely that these plants could readily be confused. Theron's argument

that an anatomical key to the **species** (South African) of *Aristida* is of economic importance is justified up to a degree. It is only after one is able to distinguish the various S. African **genera** of Gramineae solely on basis of their vegetative characters that the results of Theron's researches will fully be made use of.

#### Key to the Sections and the South African Species.

1. Central awn, or central and both lateral awns of the lemma distinctly plumose..... 2  
 Central awn, or central and lateral awns never plumose.... 3
  2. Body of the lemma with an articulation situated at or just above its middle ; at maturity the awns and column break off together with the conical hollow upper part of the lemma..... I. § *Schistachne*.  
 Body of the lemma not articulated at or slightly above its middle, but moreover the column of the awns is articulated at its point of insertion near or at the apex of the lemma ; column together with the awns disarticulating upon maturity without a part of the lemma..... II. § *Stipagrostis*.  
 Body of the lemma, column and awns show no signs of an articulation..... III. § *Chaetaria*.
  3. Body of the lemma, column and awns show no signs of an articulation ; column present or totally wanting ; callus never bifid..... III. § *Chaetaria*.  
 An articulation is present, very rarely absent, but if so then callus always bifid..... 4
  4. The articulation is situated at the summit of the column just below the branching point of the awns ; column usually well developed ; callus never bifid..... IV. § *Pseudarthratherum*.  
 The articulation is situated between the summit of the lemma and the foot of the column ; if the column is absent then the callus is distinctly bifid or rounded..... 5
  5. Callus bifid, emarginate, truncate or long-acute ; column of awns usually well-developed ; if absent, then the callus distinctly bifid. The articulation is situated between the apex of the lemma and the foot of the column..... V. § *Arthratherum*.  
 Callus rounded ; column is totally wanting, the articulation is situated between the lemma and the branching-point of the awns ; margins of the lemma involute..... VI. § *Pseudochaetaria*.
- I. § *Schistachne* (Fig. et Denot.) *Henr.***
1. Panicle very dense and spikelike ; spikelets nearly sessile ; position of the glumes usually inverse, the lower usually distinctly longer than the upper..... 2  
 Panicle not dense and spikelike, but loose, or more or less contracted ; spikelets pedicelled ; position of the glumes not inverse, the lower shorter or much shorter than the upper..... 3
  2. Lower glume long hairy..... *Hochstetteriana* (1).  
 Lower glume never hairy..... *secalina* (2).

3. All the awns of the lemma plumose, usually equally strongly so, or the lateral awns not as densely plumose as the central awn ..... 4  
 Only the central awn of the lemma plumose and densely feathery upwards, the lateral awns never plumose ..... 7
4. Internodes woolly or pubescent just below the nodes; panicle-branches woolly-pubescent ..... *proxima* (3).  
 Internodes glabrous or scaberulous but never woolly-pubescent; panicle-branches scabrous or glabrous ..... 5
5. Suffrutescent and rigid perennial; innovations and branches fascicled; culms 4-5-noded; nodes perfectly glabrous.. *namaquensis* (4).  
 Caespitose perennial; culms never branched; nodes conspicuously bearded with a ring of spreading white hairs.. 6
6. Glumes acutish, 14-16 mm. long, plumose awns obtuse in outline ..... *Schlechteri* (5).  
 Glumes obtuse, about 10 mm. long, plumose awns acute in outline with naked exerted tips ..... *hybrida naturalis* (6).
7. Glumes of a very firm texture, cartilaginous, glabrous or rigidly ciliate, subequal, linear-oblong, obtuse, with emarginate and slightly ciliolate tips ..... 8  
 Glumes thin, hyaline or papery in texture, glabrous or softly hairy, unequal, lanceolate, acuminate ..... 13
8. Nodes conspicuously bearded with a ring of spreading white hairs ..... 9  
 Nodes perfectly glabrous and smooth ..... 12
9. Leaf-sheaths and leaf-blades of culm and innovations densely lanate or villous ..... *ciliata* Desf. var. *villosa* (7a).  
 Leaf-sheaths and leaf-blades of culm and innovations never woolly or villous, sometimes slightly hairy on the margin 10
10. Glumes glabrous, not ciliate with spreading hyaline hairs.. *ciliata* Desf. var. *capensis* (7).  
 Glumes or at least the upper glume ciliate with spreading hyaline hairs ..... 11
11. Both glumes ciliate with spreading hyaline hairs ..... *ciliata* Desf. var. *pectinata* (7b).  
 Only the upper glume with spreading hyaline hairs ..... *ciliata* Desf. var. *tricholaena* (7c).
12. Glumes 8.5-12.5 mm. long, usually glabrous, rarely both rigidly ciliate ..... *Schaeferi* (8).  
 Glumes 8-9 mm. long, only the upper ciliate with rigid long hyaline hairs ..... *Schaeferi* Mez var. *biseriata* (8a).
13. Panicle erect, linear, very narrow and contracted, but somewhat interrupted near the base; glumes 12-16 mm. long *Dinteri* (9).  
 Panicle open, rather loose; glumes 6-8 mm. long ..... 14

14. Glumes covered with soft spreading hairs..... *prodigiosa* (10).  
 Glumes quite glabrous..... *prodigiosa* Welw. var.  
*calva* (10a).

II. § *Stipagrostis* (Nees) Trin. et Rupr.

1. All the awns plumose with long spreading hairs, or the lateral awns at times very scantily plumose (almost naked).. 2  
 Only the central awn plumose with long spreading hairs, the lateral awns quite naked or very rarely scantily adpressedly ciliate-pubescent..... 11
2. Column of awns well developed (1.5–12 mm. long) and more or less twisted..... 3  
 Column of awns wanting, or sometimes only very short or minute, not twisted into a beak..... 8
3. Nodes glabrous; tip of the central awn always very acute in outline..... 4  
 Nodes distinctly bearded with a ring of hyaline spreading white hairs; central awn plumose to the very tip, obtuse in outline..... *Schlechteri* (5).
4. Column of awns quite glabrous..... 5  
 Column of awns distinctly hairy..... 6
5. Column of awns much exceeding the glumes; feathers of awns usually bright yellow..... *capensis* Thunb. var.  
*macropus* (11b).  
 Column of awns shorter than or slightly exceeding (by 1–2 mm.) the glumes, feathers of awns white or canescent... *capensis* Thunb. var.  
*genuina* (11a).
6. Glumes glabrous..... 7  
 Glumes distinctly softly hairy..... *capensis* Thunb. var.  
*Dieterleniana* (11c).
7. Panicle usually overtopped by the leaves; glumes subequal; column of awns up to 4 mm. long..... *capensis* Thunb. var.  
*barbata* (11d).  
 Panicle not overtopped by the leaves; glumes slightly unequal; column of awns 6–12 mm. long..... *capensis* Thunb. var.  
*canescens* (11e).
8. Lower glume exceeding the upper in length; axils of the panicle-branches glabrous..... *damarensis* (12).  
 Lower glume shorter than the upper; axils of the panicle-branches glabrous or bearded..... 9
9. Panicle dense and spike-like; axils of the panicle-branches glabrous; the branching-point of the awn produced into two thin, hairy appendages; awns about equal, up to 10 mm. long, equally strongly plumose..... *sabulicola* (13).  
 Panicle effuse, pyramidal; the branching-point of the awns not produced into appendages; awns unequal, the central awn densely plumose, the lateral awns almost naked (at most very scantily plumose)..... 10



10. Axils of the panicle-branches distinctly bearded; central awn obtuse in outline..... *Marlothii* (14).  
 Axils of the panicle-branches quite glabrous; central awn subacute in outline..... *lutescens* (15).
11. Dwarf annuals, not exceeding 10 cm. in height; inflorescences much congested and almost spike-like..... 12  
 Perennial species, or if annual then taller than 10 cm..... 13
12. Plants compactly caespitose with the inflorescences almost hidden among the leaf-blades; branching-point of the awns not conspicuously hairy..... *subacaulis* (16).  
 Plants more diffuse with the culms geniculately ascending; lower nodes usually well-exserted; branching-point of the awns conspicuously hairy..... *Hermanni* (17).
13. Glumes hirsute or pilose over their whole surface, sometimes glabrous only at the tips..... 14  
 Glumes glabrous and smooth over their whole surface, rarely with a few marginal hairs, or scaberulous on their whole surface..... 18
14. Column of the awns glabrous below their branching-point or without a pencil of hairs at their branching-point; central awn obtuse in outline, plumose to the very tip; panicles short, spike-like, congested, often sheathed by the uppermost leaf..... 15  
 Column of the awns hairy below their branching-point, or with a pencil of hairs at their branching-point; central awn with a naked exserted tip; glumes shortly hairy or pubescent..... 16
15. Culms with very unequal internodes, short near the base, longer upwards and short again towards the top; leaf-blades of culm-sheaths not well-developed..... *geminifolia* (18).  
 Culms with very nearly equal internodes; leaf-blades of culm-sheaths well-developed..... *fastigiata* (19).
16. Annual plants; lower glume up to 6 mm. long, the upper up to 10 mm. long..... *hirtigluma* (20).  
 Erect perennial plants; lower glume  $\pm$  10 mm. long, the upper  $\pm$  13 mm. long..... 17
17. Central awn equally plumose from the base to very near the tip..... *gracilior* (21)  
 Central awn naked below, with a pencil of hairs at the branching-point of the awns..... *gracilior* Pilger var. *intermedia* (21a).  
 Central awn naked in the lower part, not bearded at the branching-point of the awns..... *gracilior* Pilger var. *Pearsonii* (21b).
18. Lower glume exceeding the upper in length; lower glume with many longitudinal rows of minute scabrous hairs on the outer surface..... *obtusata* (22).  
 Lower glume shorter than the upper; lower glume not conspicuously minutely scaberulous..... 19

19. Vegetative parts covered with tubercular prominent glands ;  
suffrutescent rigid perennial..... *brevifolia* (23).  
Vegetative parts devoid of tubercular glands ; suffrutescent  
or caespitose perennials, rarely annuals..... 20
20. Column with a pencil of hairs at the branching-point of the  
awns..... 21  
Column without a pencil of hairs at the branching-point of  
the awns..... 23
21. Central awn naked at least in its lower third..... *uniplumis* (24).  
Central awn plumose to the base..... 22
22. Glumes about 14 mm. long ; central awn somewhat rigid and  
bristle-like..... *uniplumis* Licht. var.  
*Neesii* (24a).  
Glumes 8-10 mm. long ; central awn not as above..... *uniplumis* Licht. var.  
*Pearsonii* (24b).
23. Sheaths of the innovations densely white woolly or at least  
the margins villous ; dwarf caespitose plants..... 24  
Sheaths of the innovations never densely white-woolly ;  
plants usually from a suffrutescent much-branched base 25
24. Leaves long-hairy between the longitudinal ridges. Axis of  
inflorescence scaberulous. Nodes and apices of pedicels  
hairy..... *gonatostachys* (25).  
Leaves glabrous. Axis of inflorescence glabrous. Nodes  
and apices of pedicels not long-hairy..... *lanipes* (26).
25. Axils of panicle-branches with conspicuous pencils of hairs *Marlothii* (14).  
Axils of panicle-branches glabrous..... 26
26. Central awn plumose, acute in outline ; glumes glabrous,  
unequal..... 27  
Central awn plumose, obtuse in outline ; glumes subequal,  
usually purple, the lower in the young state dorsally often  
somewhat shortly hairy, scaberulous on the keel upwards *Dregeana* (27).
27. Column 8-10 mm. long..... *garubensis* (28).  
Column 2-5 mm. long..... *lutescens* (15).

### III. § *Chaetaria* (Beauv.) Trin.

1. Awns and column of the lemma densely plumose and hairy  
as in § *Stipagrostis*..... 2  
Awns and column of the lemma never plumose or hairy, at  
most scabrid or glabrous only..... 3
2. Glumes densely villous ; nodes perfectly glabrous..... *sericans* (29).  
Glumes quite glabrous ; nodes with a ring of long spreading  
white hairs..... *hybrida naturalis* (6).
3. Internodes covered with a fugacious adpressed wool below  
the nodes, or lanate-woolly all over, sometimes the lower  
internodes only woolly or pubescent-lanate and the upper  
glabrous..... *Sciurus* (30).  
Internodes glabrous or scabrous, rarely with some short hairs  
below the nodes..... 4

4. Panicles dense and spike-like or laxly contracted and more or less interrupted..... 8  
     Panicles effuse and open, with the branches remote and divaricate..... 5
5. Position of the glumes inverse, the lower glume exceeding the upper in length..... *bipartita* (31).  
     Position of the glumes not inverse, but subequal or the lower much shorter than the upper..... 6
6. Annual plants, often somewhat delicate..... 7  
     Perennial plants, usually somewhat robust; the lemma shorter than or as long as the glumes; the tips of the glumes reaching up to or surpassing the branching-point of the awns..... *canescens* (34).
7. Glumes very acute, prominently awned, exceeding the lemmas..... *scabrivalvis* (32).  
     Glumes acute or obtuse, not awned, or the upper glume at most bifid with a mucro from the sinus; lemmas as long as or longer than the glumes..... *effusa* (33).
8. Column well-developed, very variable in length, distinctly twisted..... 9  
     Column wanting or lemma is produced into a short scarcely-twisted beak..... 12
9. Lower glume exceeding the upper in length, position of glumes "inverse"..... *monticola* (35).  
     Lower glume always shorter than the upper..... 10
10. Glumes unequal, the lower about  $\frac{1}{2}$  to  $\frac{2}{3}$  as long as the upper; internodes distinctly compressed..... *junciformis* (36).  
     Glumes about equal or slightly unequal, the upper only 1-1.5 mm. longer than the lower; internodes not compressed..... 11
11. Spikelets small; glumes shorter than 10 mm.; lateral awns almost absent or at least much more weakly developed than the central awn; culms usually much-branched from the nodes..... *transvaalensis* (37).  
     Spikelets larger; glumes about 10 mm. long or longer, the lower frequently slightly recurved from the apex and either smooth, scabrous to minutely hairy especially towards the tip; culms rarely branched from the nodes..... *aequiglumis* (38).
12. Lower glume exceeding the upper in length..... 13  
     Lower glume always shorter than the upper..... 14
13. Lemmas with longitudinal rows of spiny hairs..... *rhiniochloa* (39).  
     Lemmas smooth, the midrib scabrous only..... *andoniensis* (40).
14. Panicles very dense and spike-like, obovate in outline, up to 6 cm. long; body of lemma very scabrous with longitudinal rows of spiny hairs and furrowed ventrally..... *Hubbardiana* (41).  
     Panicles not densely spike-like; body of lemma not very scabrous and not furrowed ventrally..... 15

15. Perennial plants..... 16  
 Annual plants..... 19
16. Glumes very unequal, the lower about half the length of the upper; spikelets usually small and dark purple..... *recta* (42).  
 Glumes equal or unequal, the lower more than two-thirds as long as the upper..... 17
17. Culms markedly compressed below the nodes especially towards the base..... *junciformis* (36).  
 Culms terete..... 18
18. Culms 1-noded; blades very narrow, setaceous; panicles short, about 2-2.5 cm. long, lax..... *Galpinii* (43).  
 Culms more-noded; blades flat; panicles not short, usually long or very long..... *canescens* (34).
19. Glumes very obtuse and rather broad, both erosebifid and with a mucro from the sinus..... *curvata* (44).  
 Glumes acute or subacute and minutely awned, at least the lower, the upper commonly obtuse and bifid, with a mucro from the sinus..... 20
20. Awns of the lemma triquetrous above, very flat over a long distance, with a pronounced midnerve and hyaline rather broadly winged margins; panicle erect and rather compact and spike-like, now and again somewhat interrupted... *submucronata* (45).  
 Awns of the lemma terete or mostly subtriquetrous, sometimes slightly winged only at the very base, without broad hyaline margins; panicle somewhat lax at times even flexuous, not very dense and spikelike..... *adscensionis* L. subsp. *guineënsis* (46).

#### IV. § *Pseudarthratherum* Chiov.

1. Panicles lax and open or composed of more or less peduncled false spikes, sometimes loosely contracted, the long branches erect and appressed, but always naked below and never dense and spike-like..... *barbicollis* (47).  
 Panicles densely contracted, spike-like, the branches very short, spikelet-bearing from the base, sometimes interrupted or with 1-2 peduncled additional false spikes at the base, rarely not dense and spike-like, but narrowly linear and more or less interrupted, with flexuous sub-second branches nearly always spikelet-bearing from the base..... 2
2. Lemma granular, densely tubercled in its upper part, quite smooth only in its lower quarter-part..... *alopecuroides* (48).  
 Lemma smooth, or scabrous only under a strong lens, never densely tubercled..... 3
3. Panicles contracted and much-branched, the branches erect or slightly spreading, never spike-like, glumes not very unequal, panicle up to 20 cm. long..... *Pilgeri* (49).  
 Panicles spike-like, densely contracted, if branched or interrupted at the base, then branches usually spreading, glumes unequal..... 4



4. Rigid perennials, inflorescence up to 20 cm. long..... *longicauda* (50).  
 Annual or perennial, inflorescence rarely up to 15 cm. long,  
 the whole plant usually not exceeding 60 cm. in height.. *congesta* (51).

# V. § *Arthratherum* (Beauv.) Reichb.

1. Callus bifid or more rarely almost truncate, rounded or slightly emarginate..... 2  
 Callus conical, long acute, never bifid..... 10
2. Glumes equal or nearly so..... *spectabilis* (52)  
 Glumes very unequal..... 3
3. Foot of awns more than 2 cm. long, usually 2.5-3 cm. long *stipoides* (53).  
 Foot of awns shorter than 2 cm., usually only about 1 cm. long..... 4
4. Ligule a more or less woolly fringe, or a dense line of long soft hairs surrounding the mouth of the sheaths like a flake of wool; if flake of wool absent then the lowermost internodes densely lanate..... 5  
 Ligule a line of very short hairs, no flake of wool present.. 6
5. Lower internodes densely woolly, the upper glabrous; column of awns rather short, about 6.5 mm. long..... *vestita* (54).  
 Lower and other internodes glabrous; column of awns usually rather long, up to 15 mm. long..... *meridionalis* (55).
6. Culms usually fascicled from a much-branched base and lower nodes..... 7  
 Culms never fascicled but usually one- to several-noded.. 8
7. Callus truncate, obliquely truncate, rounded or even slightly emarginate; lemma dorsally glabrous, very rarely minutely scaberulous..... *dasydesmis* (56).  
 Callus distinctly bifid; lemma dorsally distinctly scaberulous *Engleri* (57).
8. Culms several-noded; lower glume  $\pm$  6 mm. long, the upper  $\pm$  12 mm. long..... *diffusa* Trin. var. *Burkei* (58a).  
 Culms 1-2-noded; lower glume  $\pm$  8-9 mm. long, the upper  $\pm$  15-18 mm. long, if both shorter then the column very short or almost absent..... 9
9. Column very short or absent..... *diffusa* Trin. var. *pseudohystrix* (58b).  
 Column well developed  $\pm$  7 mm. long..... *diffusa* Trin. var. *genuina* (58).
10. Internodes densely woolly or lanate-tomentose..... *mollissima* (59).  
 Internodes quite glabrous or minutely scaberulous only, never pubescent..... 11

11. Inflorescence dense, more or less elongate and spike-like ;  
 column of awns more than 3.5 cm. long..... *stipitata* (60).  
 Inflorescence fairly lax, never dense and spike-like ; column  
 of awns about 2 cm. long or somewhat longer..... *graciliflora* (61).

#### VI. § *Pseudochaetaria* Henr.

Only South African species..... *hordeacea* (62).

### ENUMERATION OF THE SPECIES.

1. **A. Hochstetteriana** Beck ex Hack. in Verh. Bot. Ver. Prov. Brandenb. **30**. 144 (1888) ; Dur. et Schinz, Consp. **5**. 803 (1894) ; Hack. in Bull. Herb. Boiss. **4**. Append. iii. 18 (1896) ; Stapf in Dyer, Fl. Cap. **7**. 571 (1899) ; Bolus in Ann. S. Afr. Mus. **9**. iv. 234 (1915) pro parte ; Dinter in Fedde, Rep. **15**. 342 (1918) ; Garabedian in Ann. S. Afr. Mus. **16**. ii. 402 (1925) pro parte ; Henrard Crit. Rev. **2**. 234 (1927) ; Henrard Monogr. **1**. 37 cum ic. tab. 1 (1929) ; Range in Fedde, Rep. **33**. 9 (1933).

*Perennial*, densely caespitose, branched from near the base, forming dense tufts. *Culms* simple, up to about 50 cm. high, erect or somewhat geniculately ascending, 2-4-noded ; internodes terete, substriate, minutely scaberulous or glabrous ; nodes glabrous, often swollen, exserted. Lower *leaf-sheaths* reduced and scale-like, with very short blades, striate, scaberulous, often more or less woolly at the base ; upper leaf-sheaths tight, striate, scaberulous or with scattered long tubercle-based hairs, shorter than the internodes ; *ligule* a short ciliate rim ; auricles shortly ciliate more rarely long-bearded ; collar smooth ; *blades* convolute or setaceous, those of the innovations up to 14 cm. long, the culm-blades up to 25 cm. long, ending in a setaceous point, glabrous or with scattered long tubercle-based hairs beneath, hirtellous on the upper surface, striate. *Panicle* excluding the awns up to 9 cm. long, usually much shorter, dense, spike-like, up to 1 cm. broad ; axis scaberulous, the lowermost axils of the branches sometimes with a tuft of hairs ; branches solitary, divided nearly from the base ; branchlets very short, scabrous ; pedicels scabrous, about 1-2 mm. long, clavate. *Spikelets* congested, yellowish or greenish. *Glumes* narrowly linear or lanceolate, acuminate, 3-nerved with a stronger midnerve ; the lower glume very scabrous and with long spreading hairs especially dorsally, 13-18 mm. long, *not always exceeding the upper glume in length* ; the upper glume about 12-17 mm. long, glabrous or scaberulous only. *Lemma* spindle-shaped, together with the callus and up to the articulation 5-7 mm. long, below the articulation densely punctulate-scabrous, above the articulation smooth, from the articulation to the branching-point of the awns 8-10 mm. long ; column slightly scaberulous, twisted ; central awn plumose and long-feathery above the middle, the feathery part obtuse in outline, naked in lower quarter, with a naked excurrent tip, 5.5-7.5 cm. long ; lateral awns fine, scaberulous or smooth, 2.2-2.4 cm. long. *Callus* very acute, adpressedly hairy below, long-hairy above, 2.0-2.5 mm. long. *Anthers* 6.0-7.0 mm. long.

#### SOUTH-WEST AFRICA.

Onguati, lichte Buschsteppe, IV. 1913, Engler 6187 (B, K) ; Spitzkopje, V. 1936, Boss TM 36138 pro parte (T) ; Spitzkopje, I. 1937, Boss TM 36359 and 36378 (T) ; Usakos, V. 1936, Wilson NH 21388 (N) ; do., XII. 1938, Volk 133 (D) ; Aukas, V. 1930, Bradfield 571 (N) ; Kubas-Habis, IV. 1913, Dinter 2820 (B) ; Kubas-Ababis, IV. 1913, Engler 6134 (B) ; Haikamchab, I. 1907, Galpin et Pearson 7594 (K, N, V) ; Otjimbingue, 1897, Fischer 68 (B) ; Walfish Bay, 100 KM east of, Wyley s.n. (V) ; Quartel near Rehoboth, IV. 1911, Dinter 2172 (B) ; along the Gamgam River, III. 1905, Von Trotha 15a (B) ; Gamkamas, III. 1911, Dinter 1990 (B, W) ; Gelwater near Gibeon, IV. 1912, Range 1328 (B, W) ; Kammachas, Range 1415 (B) ; Mount Brukkaros, IV. 1927, Sordahl 37 (BM, W)

et *Sordahl* 38 pro parte (BM); Am Löwenfluss bei Gawachab, II. 1910, *Schäfer* 444 (B); 12 KM west of Sandverhaar, II. 1909, *Pearson* 4605 (K); Inachab, Sandrivier, *Dinter* 1107 (B, Z); Haobes (Hoabes?), *Dinter* 1473 (B); without precise locality, *Pearson* 7798 (BH, K) and *Lüderitz* 66 (B, Z).

#### TYPE SPECIMEN.

The type-gathering (*Wyley* s.n.) consists of 7 sheets deposited in the Naturhistorisches Museum, Wien. Beck's manuscript description and dissections are still attached to one of the sheets, and this has consequently been selected by Henrard (*Crit. Rev.* 235) as the type.

#### ECONOMIC NOTES.

This species is considered an especially valuable grass. Several collectors state in their field notes that it is much relished by stock.

#### 2. *A. secalina* Henrard *Crit. Rev.* 3. 552 (1928); Henrard *Monogr.* 1. 36 cum ic. tab. 1 (1929).

*A. Hochstetteriana* Beck ex Hack. sec. Garabedian in *Ann. S. Afr. Mus.* 16. ii. 402 (1925) pro parte, non Beck ex Hack. *Aristida* nov. spec. ex aff. *A. hordeaceae* sec. Hack. in *Bull. Herb. Boiss.* 4 Append. iii. 20 (1896).

Since this species is very closely related to *A. Hochstetteriana* and may only be distinguished from this in having a glabrous lower glume, it was thought superfluous to draw up a separate description. The description of *A. Hochstetteriana* thus covers the following specimens except for the point of difference mentioned above.

#### SOUTH WEST AFRICA.

Northern districts (no definite locality indicated), I. 1930, *Drinkuth* 4 (B, K, N, W); Outjo, V. 1933, *Ter Horst* TM. 31844 (T); Spitzkopje, I. 1937, *Boss* TM. 36401 (K, N, T); Karibib, IV. 1913, *Engler* 6163 (B, K); Haikamchab, I. 1907, *Galpin et Pearson* 7435 (K, N, S); Awas mountains, V. 1936, *Boss* TM. 36237 (T); Reise von Walfishbay nach Okahandja, XI. 1885, *Lüderitz* 72 (B, Z); Hereroland, anno 1885/1886, *Lüderitz* 43 (B).

#### TYPE SPECIMENS.

The two sheets *Lüderitz* 72 et 43 are deposited in the Botanisches Museum, Berlin-Dahlem.

#### REMARKS.

Henrard (*Crit. Rev.* 552) states that the specimens on which he based his description are in a very imperfect condition. Owing to the very overmature and damaged condition of *Lüderitz* 72, the present author has found it somewhat difficult to align and identify modern material with this species. After much deliberation and careful examination of the type specimen, he has decided that *A. secalina* Henrard is a close ally of *A. Hochstetteriana* Beck ex Hack. It differs from the latter species by having glabrous glumes. The inverse length of the glumes is not a constant difference, since this character is also met with in *A. Hochstetteriana*.

Henrard's type shows the presence of spikelets in which the column of the lemma is not twisted. This may be explained by the fact that these lemmas are not well-developed. Otherwise they would have disarticulated, since most of the other columns were shed. The more recent gathering *Galpin & Pearson* 7435 also shows the presence of spikelets in which the column of the lemmas is either twisted or not twisted, a character which is thus not reliable. The type specimen has naked central awns. Careful examination has revealed the presence of many "tubercles" in the upper part of these awns. These "tubercles" undoubtedly represent the points of attachment of hairs, and thus the awns at one time or other were plumose. The opinion voiced by Henrard that this species is an "anomalous" [*Monogr. Gen. Aristida* 1. 24 (1929)] member of the § *Schistachne* can thus no longer receive any support.



3. **A. proxima** Steud. Syn. Pl. Glum. 1. 145 (1854); Dur. et Schinz, Consp. 5. 807 (1894); Stapf in Dyer, Fl. Cap. 7. 566 (1899); Henrard Crit. Rev. 3. 468 (1928); Henrard Monogr. 1. 38 cum ic. tab. 4 (1929); Theron in Fedde, Rep. 40. 14 (1936).

Elegant, erect or ascending glaucous *perennial*. Culms simple or more rarely branched near the base which appears to be a creeping rhizome, 15–35 cm. high, densely woolly at and just below the nodes, otherwise pubescent, terete or subcompressed, 2–6-noded; internodes usually shortly exserted. Sheaths striate, tight, pubescent with adpressed hairs, the sheath-nodes with a ring or tuft of long white hairs, densely tomentose or woolly; ligules a ciliate rim; auricles densely bearded, the hairs united into a ring at the junction of the blade and the sheath; blades convolute, filiform, rigid and subpungent, glaucous, adpressedly pubescent in lines or becoming glabrous beneath, more or less scabrous-hirtellous on the upper surface, curved, gradually narrowed but not setaceously pointed, up to 10 cm. long, but usually much shorter. Panicle narrow, but rather loose, up to 15 cm. long, but usually shorter, well- or shortly-exserted or sheathed by the uppermost leaf at the base; peduncle pubescent or hairy, angular or subterete; axis of panicle subterete and grooved, somewhat contorted, adpressedly hairy, the axils densely woolly; branches binate, erect, simple or the lower branched above the middle, naked in lower part, up to 5 cm. long, few-flowered, usually only 2–5-spiculate, pubescent; pedicels erect or more or less curved, up to 8 mm. long or sometimes as long as the glumes, subclavate, densely woolly towards their tips. Spikelets yellowish and pallid. Glumes unequal, glabrous and smooth, 3-nerved, the lateral nerves shorter than the midnerve and anastomosing with it; the lower 6.5–10 mm. long, the upper 8–11.5 mm. long, both acuminate and mucronate from a slightly bifid apex, both scaberulous only on the keel above. Lemma glabrous, lanceolate-oblong, rounded at the base, abruptly narrowed into the 1.5–2 mm. long callus, body of lemma including the callus 5.25–7.0 mm. long; callus very acute and narrow, long-pointed, densely hairy; articulation of the lemma about 3.5–5 mm. from the base of callus. Awns deciduous with upper part of the lemma, subequal or usually the central awn longer, plumose all along, the lateral from 5.5–9.0 mm. long, the central awn 6.0–11.5 mm., tips not exserted, feathery part very obtuse in outline. Pale broader than long, truncate, nerveless. Lodicules very obtuse. Anthers 4 mm. long.

#### CAPE PROVINCE.

Lady Grey distr.—Between Kraai River and Wittebergen, Zeyher 194 (B, K, P, V, Z). Aliwal North distr.—Aliwal North, XII. 1892, Flanagan 1657 (A, BH, N, K); Sister Stephanie 212 (A, BH, D, K, N).

#### TYPE SPECIMEN.

Zeyher 194 is deposited in Herb. Steudel, Museum National d' Histoire Naturelle, Paris.

4. **A. namaquensis** (Nees) Trin. et Rupr. Spec. Gram. Stip. 174 (1842); Walp. Ann. Bot. 3. 750 (1852); Steud. Syn. Pl. Glum. 1. 145 (1854); Dur. et Schinz, Consp. 5. 805 (1894); Hack. in Bull. Herb. Boiss. 4 Append. iii. 19 (1896); Bolus in Ann. S. Afr. Mus. 9. IV. 233 (1915); Dinter in Fedde, Rep. 15. 312 (1918); Garabedian in Ann. S. Afr. Mus. 16. II. 403 (1925) pro parte; Henrard Crit. Rev. 2. 369 (1927); Henrard Monogr. 1. 39 cum ic. tab. 3 (1929); Range in Fedde, Rep. 33. 8 (1933) pro parte. *A. dregeana* Trin. et Rupr. sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 234 (1915) pro parte, non Trin. et Rupr. *A. fruticans* Burchell, Travels 1. 492 (1822) nomen tantum. *A. lutescens* Trin. et Rupr. sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 233 (1915), non Trin. et Rupr. *A. namaquensis* Trin. ex Steud. Nomencl. ed. 2. 1. 131 (1842); Stapf in Dyer, Fl. Cap. 7. 566 (1899). *A. namaquensis* (Nees) Trin. et Rupr. var. *vagans* (Nees) Walp. Ann. Bot. 3. 750 (1852). *A. pungens* Desf. sec. Hack. in Bull. Herb. Boiss. 4 Append. III. 19 (1896); sec. Garabedian in Ann. S. Afr. Mus. 16. II. 404 (1925), omnes non Desf. *Arthratherium namaquense* Nees, Fl. Afr. Austr. 1. 185 (1841); Presl. Bot. Bemerck. 121 (1844); Linnaea 20. 253 (1847).

Suffrutescent with a long creeping rhizome, stoloniferous, innovation-buds covered with densely imbricate scale-like sheaths, the latter striate and glabrous except for the



woolly lower margins, and bearing reduced deciduous spinelike blades. *Culms* fascicled, ascending or prostrate, woody below, simple or usually with fascicles of erect branches from the lower or the middle nodes, at times very long and reaching a height of 2 meters (*Bryant*), glabrous and smooth. *Sheaths* very tight, firm, pallid, glabrous, striate or smooth, more rarely more or less hairy, longer or slightly shorter than the internodes; *ligules* and auricles minutely ciliate only; collar smooth; *blades* setaceous or subulate, convolute, the lower very short, very rigid and pungent, the upper longer, up to 25 cm. long, glaucous, glabrous, smooth on the lower surface, hispidulous on the upper surface. *Panicle* more or less exserted, narrow, linear, more or less contracted but rather loose, up to 30 cm. long or usually shorter; rhachis straight or subflexuous, nearly smooth, branches solitary, nearly sessile, erect or suberect, bipartite nearly from the base, or the branchlets fascicled, the lower ones up to 7.5 cm. long, scabrous and filiform like the branchlets, lateral spikelets with branches much shorter than the glumes. *Spikelets* yellowish, pallid, erect. *Glumes* rather firm, unequal, lanceolate to linear-lanceolate, acuminate, tips minutely truncate or slightly bifid, 3-nerved, glabrous, involute, the lower 8–13 mm. long, the upper 9.5–15 mm. long. *Lemma* subcylindric, glabrous, produced into a straight or somewhat twisted short beak, the body articulated 2.5–5 mm. below the branching-point of the awns, total length of lemma and column 8–11 mm; *callus* conical 1.5–2 mm. long, acute and pointed, hairy. *Awns* somewhat unequal and variable in length; the central from 11–25 mm. long, the lateral from 8–18 mm. long, all the awns plumose to the very tips, the central subobtusate and the lateral subacute in outline, the side bristles finer than the central awn and scantily adpressedly plumose at the base, more densely so above. *Pale* broad, about 1.5 mm. long, nerveless. *Lodicules* 1 mm. long, few-nerved. *Anthers* 4.5 mm. long.

#### SOUTH-WEST AFRICA.

Omuvaruma river, XII. 1938, *Volk* 403 (D); below Ababes, Tsondeb River, XII. 1915, *Pearson* 9155 (K, S); Haikamchab, I. 1907, *Galpin et Pearson* 7426 (BH, K, N, P, S); Awas mountains, I. 1916, *Pearson* 9646 (S); between Choaberib and Gurumanes, I. 1916, *Pearson* 9416 (K); Rehoboth, XII. 1890, *Fleck* 21a (Z); between Zendinglsgrab and Kub, III. 1905, *Von Trotha* 22 (B); Orab, *Dinter* 2027 (B, W); Gründoorn, VI. 1931, *Oertendahl* 334b (K, N); Khamis, Riverbed of Konkip, *Schultze* 471 (B); Beersheba, I. 1931, *Sordahl* 44 (EM, W); Kunguibgebirge, *Range* 1062 (B); Lüderitzbucht, *Schäfer* 377 (B); Rotkuppe Station, II. 1909, *Pearson* 4189 (A, D, K, S); 18 KM west of Aus, II. 1909, *Pearson* 4203 (BH, K); Aus, *Schenck* 171 (Z); West of Aus, II. 1909, *Pearson* 4206 (K) et 4208 (K) et 4217 (A, K); Buchholzbrunn, riverbed, II. 1909, *Pearson* 3644 (K) et 3645 (BH, K); Sandverhaar, II. 1909, *Pearson* 3710 (K, Z) et 3713 (BH, D, K, N) et 4343 (BH, K, N); Sandverhaar, I. 1910, *Schäfer* 284 (B); Inachab, XII. 1897, *Dinter* 1108 (Z); Great Karasberg, XII. 1912, *Pearson* 8078 (B, K) et I. 1913, *Pearson* 8497 (BH, BM, K, S, Z); Holoog, I. 1916, *Pearson* 9714 (B, K, S) et 9745 (BH, K, S); Kanus, I. 1910, *Range* 899 (B); Khanibes, Horos, X. 1907, *Hartmann* 14 (B); Gabis, I. 1909, *Pearson* 4324 (K); 20 KM north of Raman's Drift, I. 1909, *Pearson* 4532 (K, S); Warmbad, 1888, *Wandres* 28 (Z); without precise locality: *Wyley* s.n. (V); *Dinter* 6413 (G); *Range* 748 (B) et 96 (B).

#### CAPE PROVINCE.

Little Namaqualand distr.: Between Arris Drift and Arnisfontein, X. 1926, *Pillans* 5322 (K); Lekkersing, IX. 1935, *Taylor* 1083 (N); Eenriet, I. 1909, *Pearson* 3082 (K); South of Brakfontein, X. 1926, *Pillans* 5565 (BH); Aggenys, I. 1909, *Pearson* 2947 (K, N); between Arkoep and Mesklip, XII. 1910, *Pillans* 5898 (BM, K, N, S); Kamabies, XII. 1908, *Pearson* 3953 (BH, K); Kamiesberg, *Zeyher* 74 (B, G, V, W, Z); Alewynsfontein, XII. 1908, *Pearson* 3335 (K); between Plaatklip and Bitterfontein, I. 1908, *Pearson* 3298 (A, D, K, S). Calvinia distr.: At Kamos, Komseep, Springbokkuil and Lospers Plaats, *Zeyher* 1814 (A, BH, BM, G, K, N, P, S, V, Z); Brakrivier, XII. 1908, *Pearson* 3901 (K); Doornriver, XII. 1908, *Pearson* 3883 (BM, N, T); near Schurkraal, XII. 1908, *Pearson*

3080 (BM, K); between Grouwater and Klipplaat, XII. 1908, *Pearson* 3282 (A, BM, K, S); Schurkraal, XII. 1908, *Pearson* 4999 (A, K, N). Van Rhynsdorp distr.: Between Kamiesberg and Nieuwfontein, *Drège* (2545) (B, BM, G, K, N, W). Clanwilliam distr.: Between Builshoek and Doorn River, XI. 1910, *Pearson* 5400 (K); Olifants River valley, XII. 1936, *Adamson* 1556 (N). Ceres distr.: Papekuil, XI. 1908, *Pearson* 3991 (A, BH, BM, K, N, S). Sutherland distr.: Roggeveld, Korhaan's Kloof, *Rehmann* 3187 (B, Z). Laingsburg distr.: At Matjesfontein, *Rehmann* 2910 (BM, K, V, Z). Prince Albert distr.: Fraserburg Road, I. 1903, *Marloth* 3056 (N); by the Gamka River, *Mundt et Maire* s.n. (K). Jansenville distr.: Jansenville, *Joseph* 8639 (N); Klipplaatrivier, *Drège* 3924 (B, G, P). Graaff-Reinet distr.: Near Riviërtjie, III. 1869, *Bolus* 1981 (BH, K, Z). Murraysburg distr.: Murraysburg, VII. 1878, *Tyson* 558 (D) et XII. 1878, *Tyson* 258 (BH) Middelburg distr.: Grootfontein, IV. 1911, *Pillans* 1854 (K). Fraserburg distr.: Williston, XI. 1921, *Foley* 189 (N) et II. 1926, *Smith* 2457 (N). Carnarvon distr.: Nieuweveld, between Brakrivier and Uitvlugt, *Drège* (B, G, O, P, S, V). Prieska distr.: Prieska, III. 1931, *Bryant* 604 (B, K, W) et II. 1932, *Bryant* 650 (K, N) et *Bryant* 4147 (Mc). Hay distr.: Griquatown, XII. 1811, *Burchell* 1885 (G, K, P) et XII. 1894, *Marloth* 2093 (N, St); Krom Aar, III. 1921, *Wilman* 2457 (K, Mc); Black Ridge, III. 1934, *Wilman* 3059 (BH, Mc); Niekerks Hoop, X. 1936, *Hafstrom* 1335 (K, Mc). Gordonias distr.: Upington, IV. 1923, *Borchers* H. 21456 (N) et V. 1923, *Borchers* H. 21495 (K) et H. 21455 (W); do., VII. 1925, *Barnard* 36143 (S); Witkop, X. 1937, *Webb* 17 (N); Zwart Puts, X. 1911 *Wilman* s.n. (K). Without precise locality: *Ecklon et Zeyher* (A, K, N); *Mundt* s.n., (B); *Pappe* s.n. (BM); *Burke et Zeyher* (O); *Buchanan* s.n. (S).

#### TYPE SPECIMEN.

The type is deposited in the Botanisches Museum, Berlin-Dahlem.

#### COMMON NAMES.

Bamboo Aristida. Bamboo grass. Hay grass. Heidegras. Hooigras. Stechgras. Steekgras. Steekriet. Steekweek.

#### ECONOMIC NOTES.

This species is reported to be of value as a sandstay and thus may prove useful in combating erosion. Although the foliage is very coarse and prickly, *Pearson* states that it is "much eaten by stock" whereas *Pillans* states that it "does not provide grazing". It is furthermore occasionally used for thatching.

5. **A. Schlechteri** *Henrard* Crit. Rev. **3**. 541 (1928); *Henrard Monogr.* **1**. 40 et 51 cum ic. tab. 1 (1929).

A hybrid between *A. capensis* Thunb. and *A. ciliata* Desf. var. *capensis* Trin. et Rupr. and agreeing in vegetative characters with the former. Caespitose perennial. Culms up to 40 cm. high, but sometimes much shorter, 2-noded. Internodes exserted, terete, somewhat striate, glabrous; nodes ciliate with spreading white hairs. Leaf-sheaths tight, striate, glabrous. Ligule a ciliolate rim; auricles bearded, collar glabrous. Leaves mostly basal, rather short, up to 14 cm. long, but usually about 6 cm. long, flexuous and curved, subrigid, setaceous, convolute, striate and glabrous below, hairy above. Panicle exserted, strictly erect, few-flowered; branches erect or ascending, scaberulous or smooth; pedicels slightly scabrous, spikelets lanceolate. Glumes firm and chartaceous, 3-nerved, yellowish, purple-flushed at the base, subequal to unequal, acute or subobtuse with minutely ciliolate tips; the lower 11-13.5 mm. long; the upper 13-16 mm. long. Articulation of the lemma 7-7.5 mm. from the base of the callus. Lemma smooth. Callus very acute, hairy, about 2-2.25 mm. long. Column of awns slightly to strongly twisted, about 7-9 mm. long, glabrous. Central awn 3.5-4 cm. long, feathery all along to the very tip, obtuse in outline; lateral awns 1.8-2.6 cm. long, naked or sparingly plumose, often one of these plumose and the other naked, tips long-exserted, rather fine.

## CAPE PROVINCE.

Little Namaqualand distr.: Windhoek, VII., 1896, *Schlechter* 8338 (A, B, BH, G, K, N, P, T, V, W, Z).

## REMARKS.

Henrard states the position of the articulation to be variable, but I have made many measurements and found this variation negligible. The articulation is situated 7-7.5 mm. from the end of the callus. It is moreover the length of the column of the lemma which shows some variation (7-9 mm.), and this is probably due to the discrepancies which Henrard mentions in regard to the position of the articulation. The length of the column of the lemma is usually fairly variable even in spikelets of one and the same panicle. See also *A. subacaulis* where the length of the column is extremely variable.

6. *A. ciliata* Desf. var. *capensis* Trin. et Rupr.  $\times$  *A.* ?

The number cited below consists of two sheets which undoubtedly represents a hybrid.

The plants superficially resemble *A. ciliata* Desf. var. *capensis* Trin. et Rupr. as the nodes are strongly ciliate with reflexed or spreading white hairs, the glumes are subequal, obtuse or truncate, and minutely ciliate at their apices, and they are furthermore slightly discoloured (purple?) at the base. The lemmas however disagree with the aforementioned species as the callus shows a great deal of variation in its degree of hairiness. It shows all intermediates from being densely bearded to being perfectly glabrous. The body of the lemma may show the presence of an articulation as in typical members of § *Schistachne*. The majority of lemmas however show no signs of an articulation and in this respect they agree with members placed in § *Chaetaria*. All three awns of the lemma are plumose and acute in outline. The awns are fairly rigid and have almost naked exerted tips, and in this respect are not unlike those of *A. capensis* Thunb. There are, however, no other characters which would suggest a relationship with the last-mentioned species. Owing to the plumose awns this hybrid bears some resemblance to *A. sericans* Hack. but differs from the latter in a number of important characters, viz. bearded nodes, obtuse and glabrous glumes, etc. To suggest *A. sericans* Hack. as the other parent is unwarranted since the former appears to be restricted to the High Veld area of the Transvaal and therefore almost certainly does not occur in the dry arid regions of the Kenhardt District.

## CAPE PROVINCE.

Kenhardt distr.: Loog Kolk, X. 1928, *Pole Evans* 43 (N).

7. *A. ciliata* Desf. var. *capensis* Trin. et Rupr. Spec. Gram. Stip. 164 (1842); Walp. Ann. Bot. 3. 748 (1852); Dur. et Schinz, Consp. 5. 802 (1894); Dinter in Fedde, Rep. 15. 341 (1918); Henrard Crit. Rev. 1. 93 (1926); Henrard Monogr. 1. 43 cum ic. tab. 2 (1929).

*A. ciliata* Desf. sec. Kunth, Enum. 1. 195 (1833); Steud. Syn. Pl. Glum. 1. 143 (1854) pro parte; Dur. et Schinz, Consp. 5. 802 (1894) pro parte; Hack. in Bull. Herb. Boiss. 4. Append. III. 17 (1896); Stapf in Dyer, Fl. Cap. 7. 563 (1899) pro parte; F. Bolus in Ann. S. Afr. Mus. 9. IV. 232 (1915) pro parte; Garabedian in Ann. S. Afr. Mus. 16. II. 401 (1925); Range in Fedde, Rep. 33. 8 (1933) pro parte, omnes non Desf.

*A. centrifuga* Burchell, Travels 1. 266 (1822) nomen tantum. *A. obtusa* Del. sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 233 (1915) pro parte, non Del. *A. piligera* Burchell ex Schult. Mant. 2. 478 (1824); Kunth, Enum. 1. 197 (1833). *A. pubigena* Burchell, Travels 1. 288 (1822). *Arthratherum ciliatum* Nees in Linnaea 7. 289 (1832). *Arthratherum Schimperii* Nees, Fl. Afr. Austr. 178 (1841); Presl, Bot. Bemerck. 121 (1844).

Perennial, compactly caespitose, branched from near the base. Innovations forming dense tufts. Culms up to 85 cm. high but usually much shorter, densely tufted, fascicled, erect or somewhat geniculately ascending from a well-developed rootstock, simple, 2-3-noded; internodes terete, nearly smooth, with a viscous ring below the nodes, slightly



striate, somewhat swollen near the nodes, exserted; *nodes long-bearded with spreading hairs, the hairs often deciduous in old culms*. Lower leaf-sheaths crowded at the base, very broad, pallid or whitish, firm and persistent, striate, glabrous or more or less woolly along the margins; upper leaf-sheaths tight, shorter than the internodes, striate, glabrous or slightly pubescent; *ligule* a short ciliate rim, auricles shortly ciliate, those of the innovations conspicuously bearded; collar glabrous; *blades* striate, glabrous and smooth beneath, minutely hairy or hirtellous on the upper surface, convolute throughout, coarsely setaceous to pungent (when short) more or less recurved, variable in length, up to 25 cm. long but usually very much shorter. *Panicle* exserted, up to 30 cm. long, narrow but open and sometimes very loose, usually contracted and erect; axis terete or subcompressed, at times striate, glabrous; branches filiform, erect or sub-erect, solitary or usually 2-3-nate, up to about 8 cm. long exclusive of the awns, often branched from near the base; pedicels glabrous, shorter to longer than the glumes, clavate at the apex. *Spikelets* linear-oblong, pale or straw-coloured, often suffused with purple at the base. *Glumes* subequal, linear-oblong, 3-nerved, glabrous, obtuse or subacute, very firm, emarginate and usually minutely ciliolate at the apex; the lower from 8.5-11 mm. long, the upper 9-12 mm. long. *Lemma* tubulous, glabrous, smooth, gradually narrowed into a slender, twisted column of a somewhat variable length, articulated 5-7 mm. from the base of the callus, 10.5-14 mm. long up to the branching-point of the awn; *callus* long-hairy, very acute, from 1.5-2.5 mm. long; central awn 4-5 cm. long, naked in lower quarter, feathery part obtuse in outline, with a short naked or minutely plumose exserted tip; lateral awns very fine, usually sub-erect, 1.5-2.5 cm. long, sometimes slightly but inconspicuously plumose in their upper part. *Anthers* 5-5.5 mm. long.

#### SOUTH WEST AFRICA.

Witvley, III. 1911, *Dinter* 1972 (B); Walfishbay, *Nachtigal* 7 (B); Salzbrunn, IV. 1913, *Engler* 6560 (B); between Dabaigabis and Gründoorn, II. 1909, *Pearson* 3159 (BM, S); between Ausis and Khuias, III. 1885, *Schenck* 218 (N, V, Z); Kunguiberge, *Range* 1064 (B); Haalenberg, IV. 1929, *Dinter* 6302 (B, BH); Keetmanshoop, 1897, *Seidel* 1 (B); Mount Brukkaros, IV. 1927, *Sordahl* 38 pro parte (B, BM, W); Angra Pequena, I. 1907, *Galpin* et *Pearson* 7522 pro parte (N); Angra Pequena, VII. 1925, *Moss* 11516 (W) et 11517 (K, WR); do., X. 1884, *Schenck* la (Z); do., 1884, *Schinz* 668 (Z) et 669 (Z); do., IV. 1886, *Marloth* 1158 (B) et 4742 (N); Rotkuppe, II. 1909, *Pearson* 4183 (K); Garub, X. 1910, *Marloth* 5001 (N, St); do., X. 1907, *Range* 522 (B); prope Aus, 1885, *Schinz* 667 (Z, V); Kubub, II. 1907, *Range* 222 (B); Kuibis, *Range* 890 (B); do., I. 1909, *Range* 654 (B); Buchholzbrunn, II. 1909, *Pearson* 3638 (BH); Sandverhaar, II. 1909, *Pearson* 4663 pro parte (BH); Inachab, XII. 1897, *Dinter* 1104 (B, Z); Klein Karas, IV. 1931, *Örtendahl* 120 (B, K, N); do., IX. 1923, *Dinter* 5000 pro parte (N); Holoog, I. 1916, *Pearson* 9811 (K); Anibebene, 1895, *Schinz* 326 (Z); Klinghardtgebirge, VIII. 1913, *Schäfer* 548 (B) et 513 (B); Great Karasberg, 1918, *Blank* 63 (B); do., Kraaikluft, I. 1913, *Pearson* 8496 (N); near Sendlingsdrift, *Range* 1556 (B); 25 Km. north of Warmbad, II. 1909, *Pearson* 4301 (BH, N); north of Ganus, II. 1909, *Pearson* 4495 (K, T); Viols Drift, IX. 1931, *Pillans* 6395 (BH); without precise locality: Namib, *Boss* TM. 36281 (T) et *Morgenstern* 31 (B, W); Walfishbay-Otyitambi, *Lüderitz* 34 (B); *Range* 1423 (B).

#### CAPE PROVINCE.

Little Namaqualand distr.: Near mouth of Orange River, *Drège* 2548 (B, BM, G, K, N, O, P, S, V); Groot Derm, X. 1926, *Pillans* 5230 (BH); between Arris Drift and Anisfontein, X. 1926, *Pillans* 5247 (BH); near Bethany Drift, XII. 1910, *Pearson* 6952 (K); Richtersveld, IX. 1925, *Marloth* 12414 (N); do., VIII. 1925, *Marloth* 12309 (N); near Oograbies, I. 1909, *Pearson* 3564 (A, K, T); between Wolftoon and Henkriesfontein, I. 1909, *Pearson* 3107 (A); Goodhouse, IX. 1930, *Henrici* 2221 (N); Henkries, XI. 1897, *Schlechter* 10 (B, BH, BM, G, K, N, P, T, W); Lekkersing, IX. 1936, *Taylor* 1096 (N); Buffelrivier, IX. 1897, *Schlechter* 11257 (A, B, BH, BM, G, K, N, P, V, W, Z); Kamiesberg, *Zeyher* 74 (V). Calvinia distr.: between Losper's Plaats and Springbokkuil, *Zeyher* 1812



(A, BH, G, K, N, P, S, Z); between Plaatklip and Bitterfontein, XII. 1908, *Pearson* 3293 (K, N); south of Klipplaat, XII. 1908, *Pearson* 3395 (BM, N, S); between Pappekuil and Stompiesfontein, XII. 1908, *Pearson* 4967 (A, BM). Clanwilliam distr.: Klaver, III. 1926, *Smith* 2600 (N); Ceres distr.: Gansfontein, XII. 1908, *Pearson* 3983 (BH, K). Beaufort West distr.: Between Dweka and Zwartbulletje, *Drège* (B, G, P, S). Fraserburg distr.: Between Patrysfontein and Great Brakriver, IX. 1811, *Burchell* 1521 (K). Prince Albert distr.: Prince Albert, XII. 1906, *Bolus* 12432 (B, BH, BM, K, N); Prince Albert Road, V. 1920, *Pillans* 7060 (BH); Jakalsfontein, *Burke* 22 (K); Gamka River, *Mundt (et Maire)* (B, G, K). Murraysburg distr.: Murraysburg, *Tyson* 280 (BH). Uitenhage distr.: Uitenhage?, *Prior* s.n. (K, S, V). Somerset East distr.: Somerset, *Bowker* s.n. (K). Middelburg distr.: Grootfontein, IV. 1911, *Pillans* 1855 (K). Victoria West distr.: Victoria West, *Schweitzer* s.n. (A). Prieska distr.: Between Modderfontein and Keikamspoort, *Burchell* 1612-4 (K); Prieska, III. 1931, *Bryant* 607 (B, K, W); do., VIII. 1918, *Pole Evans* H. 18800 (N). Kimberley distr.: Kudusberg, VI. 1936, *Wilman* 3532 (K, Mc). Hay distr.: Niekerk's Hoop, X. 1936, *Hafstrom* 1332 (Mc); Griquatown, anno 1928, *Conradie* 1 (St). Mafeking distr.: Mafeking, IV. 1929, *Pole Evans* 2404 (N). Gordonia distr.: Upington, VIII. 1912, *McDonald* H. 8132 (K, N, T); do., IV. 1923, *Borcherds* H. 21455 (K, N); Springboksvlei, XI. 1936, *Webb* 22 (N); Narougas, VII. 1925, *Barnard* 36145 (S). Without precise locality: *Pappe* s.n. (BM); *Zeyher* 1809 (BM); *Wyley* s.n. (V); *Marloth* 3718 (K, N) et 3727 (N).

#### ORANGE FREE STATE.

Bloemfontein distr.: Near Bloemfontein, IV. 1928, *Pole Evans* 2190 (N).

#### TYPE SPECIMEN.

*Drège* from Dweka and Zwartbulletje is deposited in the Botanisches Museum, Berlin-Dahlem.

#### COMMON NAMES.

Bushman Grass. Dwa-gras. Groot Boesmangras. Grosses Toagras. Habugras. Kortbeen Twa. Langbeen Twa. Ochsengras. Tall Bushman Grass. Toagras.

#### ECONOMIC NOTES.

This species is considered a very good stock food, it is eagerly grazed by both sheep and cattle. It is said to be very drought-resistant, persists many months without rain and flowers readily after a minimum of rain.

- 7A. *A. ciliata* Desf. var. *villosa* Hack. in Bull. Herb. Boiss. 4 Append. III. 18 (1896); Stapf in Dyer, Fl. Cap. 7. 564 (1899); Dinter in Fedde, Rep. 15. 341 (1918); Henrard Crit. Rev. 1. 95 (1926); Henrard Monogr. 1. 42 (1929); Theron in Fedde, Rep. 40. 10 (1936).

*A. ciliata* Desf. sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 232 (1915) pro parte; Range in Fedde, Rep. 33. 8 (1933) pro parte, non Desf. *A. prodigiosa* Welw. sec. Garabedian in Ann. S. Afr. Mus. 16. II. 404 (1925) pro parte, non Welw.

This variety may be readily recognised by the possession of densely lanate or villous leaf-sheaths and leaf-blades. It appears to occur only in the very arid regions of South West Africa.

#### SOUTH WEST AFRICA.

Olukonda, XII. 1885, *Schinz* 649 (Z); Haikamchab, I. 1907, *Galpin et Pearson* 7413 (K, N, S); Marienthal-Orab, III. 1911, *Dinter* 2013 (B); Bei Lüderitzbucht, IX. 1913, *Range* 1883 (B); Angra Pequena, 1884, *Schinz* 663 (Z); do., I. 1907, *Galpin et Pearson* 7522 pro parte (K, S); Klinghardtgebirge, VIII. 1913, *Schäfer* 546 (B); Schakalskuppe, II. 1909, *Pearson* 4800 (K); between Aos and the Orange River, III. 1885, *Schenck* 327 (N, V, Z); Buntfeldschuh, IX. 1922, *Dinter* 3922 (B, N); North of Warmbad, II. 1909, *Pearson* 4301 (D, K).

## TYPE SPECIMEN.

*Schenck* 327 both in the Botanisches Museum, Zürich and in the Naturhistorisches Museum, Wien.

## ECONOMIC NOTES.

This variety is considered a good fodder grass for cattle and horses.

- 7b. *A. ciliata* Desf. var. *pectinata* Henr. Crit. Rev. 1. 95 (1926); Henrard Monogr. 1. 42 (1929); Theron in Fedde, Rep. 40. 10 (1936).

This variety may be distinguished by the glumes both of which are always markedly ciliate with spreading hyaline hairs.

## SOUTH WEST AFRICA.

Windhuk, 1906, *Bohr* 13 (B); Zwartbankberge (Kalkberge), IV. 1886, *Stapff* 9 [B (typus !), Z]; Aus, *Lewis* H. 19007 (N); Karubeam (Karabeam Mts. ?), VII. 1931, *Pillans* 6562 (BH).

## CAPE PROVINCE.

Little Namaqualand distr.: Near Orange River mouth, VII. 1926, *Pillans* 5610 pro parte (BH, K); Clanwilliam distr.: Zoutrivier, VII. 1896, *Schlechter* 8138 (A, B, BH); Herbert distr.: Read's Drift, III. 1937, *Acock* 4321 (Mc).

## TYPE SPECIMEN.

*Stapff* 9 is deposited in the Botanisches Museum, Berlin—Dahlem.

## COMMON NAMES.

Common Groot Boesmangras. Pferdegras.

## ECONOMIC NOTE.

*Stapff* states it to be a meagre foddergrass after rain.

- 7c. *A. ciliata* Desf. var. *tricholaena* Hack. in Bull. Herb. Boiss. 4 Append. III. 18 (1896); Stapf in Dyer, Fl. Cap. 7. 564 (1899); Dinter in Fedde, Rep. 15. 341 (1918); Henrard Crit. Rev. 1. 95 (1926); Henrard Monogr. 1. 42 (1929); Range in Fedde, Rep. 33 8 (1933).

*A. ciliata* Desf. sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 232 (1915); Stapf in Dyer Fl. Cap. 7. 563 (1899); Range in Fedde, Rep. 33. 8 (1933) omnes pro parte non Desf.

This variety may be distinguished by the upper glume which is always markedly ciliate with spreading hyaline hairs. It is often found growing side by side with *A. ciliata* Desf. var. *capensis* Trin. et Rupr., the prevalent variety of this species in South Africa.

## SOUTH WEST AFRICA.

Rössingberge, XI. 1938, *Volk* 23 (D); Ababis, IV. 1913, *Engler* 6134 (K); near Welwitsch, III. 1909, *Pearson* 4472 (BH, K); Windhuk, 1906, *Bohr* 13 (B); Haikamchab, I. 1907, *Galpin et Pearson* 7413 (BH, K, N, P); do., 7412 (V); between Achterfontein and Gelwater, XII. 1912, *Pearson* 9235 (K); Lüderitzbucht, I. 1907, *Range* 204 (B); Haalenberg, IV. 1929, *Dinter* 6302 (D, K, St); Angra Pequena, XI. 1884, *Schenck* 26 (N); do., 1894, *Schinz* 672 (BH, K, Z); near Tsirub, VII. 1885, *Schenck* 10, [V, (typus !), Z]; Klinghardtgebirge, VIII. 1913, *Schäfer* 529 (B); Tsirub, *Range* 1132 (B); Great Karasberg, I. 1913, *Pearson* 8496 (BH, BM, K); Sendlingsdrift, VII. 1912, *Range* 1564 (B); 25 Km north of Warmbad, II. 1909, *Pearson* 4293 (K).

## CAPE PROVINCE.

Little Namaqualand distr.: Doornpoort, X. 1926, *Pillans* 5455 (BH); between Witbank and Orange River, X. 1926, *Pillans* 5131 (BH); Henkries, XI. 1897, *Schlechter*

10 pro parte (A). Prince Albert distr.: Swarts, V. 1920, *Pillans* 7059 (B.H). Prieska distr.: Prieska, IV. 1935, *Bryant* 607 (K, Mc). Gordonia distr.: Upington, *Pole Evans* 2175 (N). Mafeking distr.: Mafeking, IV. 1929, *Pole Evans* 2404 (K).

#### ORANGE FREE STATE.

Fauresmith distr.: Jagersfontein, IV. 1920, *Van der Walt* H. 19805 (N, W) et *van Breda* 31 (N).

#### TYPE SPECIMEN.

*Schenck* 10 is deposited in the Naturhistorisches Museum, Wien. A duplicate is deposited in the Botanisches Museum, Zürich.

#### COMMON NAMES.

Beesgras. Groot Twaagras. Tall Bushman Grass.

#### ECONOMIC NOTES.

This variety is considered to be a good foddergrass.

8. **A. Schaeferi** Mez in Fedde, Rep. **17**. 152 (1921); Garabedian in Ann. S. Afr. Mus. **16**. 404 (1925); Henrard Crit. Rev. **3**. 535 (1928); Henrard Monogr. **1**. 41 cum. ic. tab. 2 (1929); Theron in Fedde, Rep. **40**. 11 (1936).

*A. ciliata* Desf. var. sec. F. Bolus in Ann. S. Afr. Mus. **9**. IV. 232 (1915). *A. prodigiosa* Welw. sec. Hack. in Bull. Herb. Boiss. **4**. Append. III. 19 (1896); Garabedian in Ann. S. Afr. Mus. **16**. II. 404 (1925) pro parte; Dinter in Fedde, Rep. **15**. 342 (1918); omnes non Welw.

*Perennial*, compactly caespitose, branched from the base. Innovations forming rather short and dense tufts. Culms up to 65 cm. high but usually much smaller, densely tufted, fascicled, erect or somewhat geniculately ascending from a robust almost suffrutescent rootstock, simple, 2-3-noded; internodes terete, smooth, slightly striate, swollen and often viscous just below the nodes, usually exserted; *nodes perfectly smooth and glabrous*. Lower leaf-sheaths short, densely lanate, striate, at length becoming glabrous and shiny, with well-developed hyaline margins; the upper shorter than or as long as the internodes, scabrous or shortly pubescent especially along the margins, striate; *ligule* a short hairy rim; auricles pubescent or very shortly ciliate, collar glabrous; *blades* striate, nearly glabrous beneath, densely shortly villous-pubescent on the upper surface, terminating in a pungent apex; those of innovations 1-2 cm., or up to 8 cm. long, recurved, firm subulate; those of the culm leaves up to 12 cm. long. *Panicle* exserted, or at first sheathed by the uppermost leaf, up to 26 cm. long, somewhat contracted but loose; axis terete or sub-compressed, striate or grooved upwards, almost smooth; branches filiform, erect or sub-erect, solitary or 2-3-nate, up to 8 cm. long exclusive of the awns, often branched from near the base; pedicels nearly glabrous, at times almost as long as the glumes, swollen towards the apex (clavate). *Spikelets* straw-coloured, usually flushed with purple near the base. *Glumes* about equal, boat-shaped, 3-nerved, glabrous or sometimes rigidly ciliate, very firm, both 8.5-12.5 mm. long. *Lemma* tubulous, glabrous, smooth, 9-10.5 mm. long, articulated 6-6.5 mm. from the base of the callus; *callus* long-hairy, acute from 1.75-2 mm. long; central awn 4-4.5 cm. long, naked in lower third, plumose above nearly to the tip, the latter short, naked and exserted, the feathery part subacute in outline; lateral awns naked, from 1.3-2.2 cm. long. *Anthers* 5.5-6.0 mm. long.

#### SOUTH WEST AFRICA.

Lower Swakop, IV. 1886, *Marloth* 1203 pro parte (N); Rössingberge, XI. 1938, *Volk* 19 (D) et 26 (D); Tsauchab, II. 1909, *Pearson* 4949 (K); Lüderitzbucht (Angra Pequena), I. 1907, *Galpin* et *Pearson* 7583 (K); do., XI. 1908, *Marloth* 4667 (K) et IV. 1909, *Marloth* 4742 pro parte (N); do., *Schinz* 664 (Z) et *Schinz* s.n. (V); do., *Peyer* s.n. (Z); do., IV. 1929, *Dinter* in Hb. Stell. 10790 (St); Pomona, VI. 1929, *Dinter* 6421 (B, BH, D, G, K, St); do., X. 1913, *Schäfer* 549 (B, N).



## TYPE SPECIMEN.

*Schäfer* 549 is deposited in the Botanisches Museum, Berlin-Dahlem.

## REMARKS.

This species superficially resembles *A. ciliata* Desf. var. *capensis* Trin. et Rupr. but can be readily recognised by the beardless nodes and the firm subulate leaf-blades.

- 8a. *A. Schaeferi* Mez var. *biseriata* Henrard Monogr. 1. 41 (1929); Henrard Crit. Rev. Suppl. 739 (1933).

In general appearance this variety resembles the species but may readily be distinguished by having shorter glumes, of which the upper (gluma II) is dorsally rigidly ciliate with long hyaline hairs.

## SOUTH WEST AFRICA.

Welwitsch, I. 1907, *Galpin et Pearson* 7590 (N, K, S, V).

## TYPE SPECIMEN.

The type specimen is deposited in the Naturhistorisches Museum, Wien.

## REMARKS.

This variety is only known so far from the type gathering. It is apparently not at all a common plant.

9. *A. Dinteri* Hack. in Bull. Herb. Boiss. Ser. II. 1. 767 (1901); Dinter in Fedde, Rep. 15. 341 (1918); Garabedian in Ann. S. Afr. Mus. 16. II. 401 (1925); Henrard Crit. Rev. 1. 143 (1926); Henrard Monogr. 1. 45 cum ic. tab. 4 (1929); Theron in Fedde, Rep. 40. 8 (1936).

*A. coma-ardeae* Mez in Fedde, Rep. 17. 152 (1921); Garabedian in Ann. S. Afr. Mus. 16. II. 401 (1925); Henrard Crit. Rev. 1. 106 (1926). *Aristida* sp. nearest *A. plumosa* Linn. sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 235 (1915).

Densely caespitose erect glaucous *perennial* with intravaginal innovation shoots. *Culms* erect, often somewhat geniculate at the nodes, elegant, up to 40 cm. high, simple, 2-4-noded, the glabrous nodes equally distributed; internodes terete, scarcely striate, slightly thickened and grooved below the nodes and with depressed crateriform glands (which are more readily visible on old culms), smooth or scaberulous. *Sheaths* of the lower blades more or less reduced, 1-3 cm. long, rather thin, sometimes papery, densely striate, scabrous, pallid with broad hyaline margins; the upper tight, terete, scaberulous or scabrous especially along the margins, striate, at times slightly keeled, shorter than the internodes; *ligule* a ciliolate rim; auricles densely ciliate and more or less bearded or the long hairs wanting; collar glabrous; *blades* erect or very laxly curled, linear not very rigid, setaceously convolute throughout, about 1 mm. wide when expanded, acuminate, about 12-15 cm. long, very scabrous on both surfaces and hirtellous on the upper surface, terminating in a setaceous point. *Panicle* erect, linear, rather narrow, but very lax and interrupted at the base, up to 20 cm. long including the spikelets and awns, just exserted or more or less sheathed by the uppermost leaf; axis terete and nearly smooth below, like the lower branches usually with depressed crateriform glands, upwards more or less angular and scabrous, striate; branches solitary or binate, scaberulous or nearly smooth, up to 10 mm. long, each bearing 1-3 erect adpressed spikelets on secondary branchlets (pedicels); pedicels very short, nearly sessile or up to 3 mm. long, always shorter than the glumes, scabrous, laterally grooved and slightly thickened. *Spikelets* strictly erect, whitish, glumes linear-lanceolate, about equal or slightly unequal, the lower 12-15 mm. long, 3-nerved or sub-5-nerved, acute, shortly awned, more or less hairy with soft spreading hairs, the upper glume 12-16 mm. long, narrower than the lower, 3- or 5-nerved, acute or with an inrolled subobtuse apex, less hairy than the lower glume. *Lemma* glabrous, linear-tubular, body of the lemma



from base of callus up to the branching-point of the awn 16–18 mm. long, the articulation 5–5.5 mm. from the base of the callus, the body gradually narrowed into a smooth distinctly twisted column about 4 mm. long; *callus* 1.5 mm. long, very acute; central awn spreading, from 5.5–7.0 cm. long, naked in the lower quarter part, densely plumose above, with a shortly excurrent naked tip, the feathery part acute to sub-acute in outline; lateral awns very delicate and thin, suberect, naked, from 14–18 mm. long. *Anthers* 5.5–6.0 mm. long.

#### SOUTH WEST AFRICA.

Haigamkhab, I. 1904, *Pearson* 503 (K); do., I. 1907, *Galpin et Pearson* 7434 (K, N) et 7436 (K, N, S); Khan River, III. 1900, *Dinter* 1485 (N, Z); Welwitsch, I. 1907, *Galpin et Pearson* 7416 (B, K, N, S) et 7419 (B, K, N, S); do., III. 1909, *Pearson* 4416 (BH, K) et 4418 (BH, K).

#### TYPE SPECIMEN.

*Dinter* 1485 is deposited in the Botanisches Museum, Zürich.

10. **A. prodigiosa** Welw. in Trans. Linn. Soc. **27**. 80 cum tab. 25 (1869); Dur. et Schinz, Consp. **5**. 807 (1894); Welw. Cat. Afr. Pl. **2**. I. 205 (1899) pro parte; Henrard Crit. Rev. **2**. 464 (1927); Henrard Monogr. **1**. 44 cum ic. tab. 3 (1929).

*Perennial*, densely caespitose. *Culms* up to 50 cm. high, erect, simple, 2–4-noded; nodes constricted, glabrous; internodes terete and somewhat striate. *Leaf-sheaths* glaucous, glabrous or puberulous; *ligule* a ciliate rim, the auricles bearded, collar glabrous; *blades* up to 10 cm. long, curved or suberect, convolute, sulcate-striate, puberulous on both surfaces. *Panicle* erect, rather loose, linear-oblong in outline, up to 30 cm. long; axis compressed or angulate, glabrous; branches usually solitary, branched from near the base. *Spikelets* pale, yellow or greenish, purple at the base. *Glumes* subequal, keeled and acute, hairy all over, or glabrous at the margins and the apex, the hairs very soft and spreading; the lower 7 mm., the upper 8 mm. long. *Lemma* including callus and column up to branching-point of the awn 6–7 mm. long; *callus* very acute, densely hairy, about 2 mm. long; central awn naked at the base, up to 2 cm. long, scantily feathery at the tip; lateral awns naked, spreading,  $\pm$  1 cm. long.

#### ANGOLA.

Cabo negro, IX. 1859, *Welwitsch* 2000a (K, N); Mossamedes, IV. 1909, *Pearson* 2276 (K, N).

#### TYPE SPECIMEN.

*Welwitsch* 2000a is deposited in the British Museum (Natural History), London.

#### REMARKS.

Although this species has so far not been found to occur in South West Africa, it is within the bounds of likelihood that it does actually grow in the extreme north-western coastal part of that region, which from a botanical point of view is as yet almost unexplored.

- 10a. **A. prodigiosa** Welw. var. **calva** Henrard Crit. Rev. **3**. 467 (1928); Henrard Monogr. **1**. 44 (1929);

*A. prodigiosa* Welw. Cat. Afr. Pl. **2**. I. 205 (1899) pro parte.

The variety resembles the species very closely but may be easily distinguished by possessing glabrous glumes. The same general remarks with regard to the species apply to this variety.

## ANGOLA.

Near Mossamedes, IV. 1909, *Pearson* 2247 (K); between Mossamedes and R. Coroca, IV. 1909, *Pearson* 2248 (K); along Mossamedes railway, IV. 1909, *Pearson* 2881 (K).

## TYPE SPECIMEN.

*Pearson* 2881 is deposited in The Herbarium, Royal Bot. Gardens, Kew.

11. *A. capensis* Thunb. (sensu lato).

*Perennial*, compactly caespitose, glabrous. *Culms* simple, very rarely branched from the base, erect, up to 75 cm. high, wiry, smooth or scaberulous, 1-2-noded. *Leaf-sheaths* firm, glabrous, scaberulous or with a few scattered hairs, striate, shorter than the internodes; *ligule* a ciliate membrane; auricles glabrous or bearded; collar glabrous; *blades* filiform, convolute, up to 40 cm. long, at times overtopping the panicle, firm, at times flexuous, lower surface smooth, upper surface scaberulous to hispid. *Panicle* erect or more or less nodding, contracted, loose or effuse, somewhat secund, up to 30 cm. or more long; branches solitary, often branched from the base, branchlets ultimately capillary or filiform. Pedicels clavate. *Spikelets* erect or nodding, pale brown to purple. *Glumes* glabrous or hairy, unequal to subequal, linear-lanceolate; the lower 10-19 mm. long, the upper 11-20 mm. long. *Lemma* including the callus 5-8.5 mm. long, tubulous, dorsally smooth or pustulate; *callus* very acute, densely hairy, about 2.5 mm. long; column 1-14 mm. long, glabrous or hairy, usually twisted, shorter than or exceeding the glumes; awns unequal, the central 16-40 mm. long, the lateral 13-35 mm. long.

The above description has been drawn up so as to include the material enumerated under the following varieties. The salient points characterising each variety are enumerated separately under each of these varieties.

11a. *A. capensis* Thunb. var. *genuina* Henrard Crit. Rev. 1. 77 (1926); Henrard Monogr. 1. 50 cum ic. tab. 6 (1929).

*A. capensis* Thunb. Prodr. 19 (1794); Kunth Enum. 1. 95 (1833). *Chaetaria capensis* (Thunb.) Beauv. Agrostogr. 30 (1812); Roem. et Schult. Syst. Veg. 2. 395 (1817).

This variety may be distinguished by the glabrous column of the awns which is usually shorter than the glumes; at times however it exceeds the glumes by 1-2 mm. The feathers of the awns are white or canescent.

## CAPE PROVINCE.

Malmesbury distr.: Darling, IX. 1905, *Bolus* 12910 (BH, N). Worcester distr.: Hex River Valley, X. 1881, *Tyson* 610 (A, K).

## TYPE SPECIMEN.

Specimen  $\beta$  of *Thunberg* in Herb. Thunberg, Upsala, Sweden.

11b. *A. capensis* Thunb. var. *macropus* (Nees) Trin. et Rupr. Spec. Gram. Stip. 179 (1842); Walp. Ann. Bot. 3. 751 (1852); Dur. et Schinz, Consp. 5. 801 (1894); Stapf in Dyer, Fl. Cap. 7. 565 (1899); F. Bolus in Ann. S. Afr. Mus. 9. IV. 233 (1915); Henrard Crit. Rev. 1. 78 (1926); Henrard Monogr. 1. 50 cum ic. tab. 7 (1929); Theron in Fedde, Rep. 40. 16 (1936).

*A. capensis* Thunb. var. *fulviberbis* Trin. et Rupr. Spec. Gram. Stip. 179 (1842); Walp. Ann. Bot. 3. 751 (1852); Dur. et Schinz, Consp. 5. 801 (1894); Henrard Crit. Rev. 1. 78 (1926). *A. capensis* Thunb. var. *Zeyheri* Trin. et Rupr. sec. Stapf in Dyer, Fl. Cap. 7. 565 (1899) pro parte, excl. syn., non Trin. et Rupr. *Arthratherum capense* Nees var. *macropus* Nees, Fl. Afr. Austr. 176 (1841).

In this variety the column of the awns is glabrous and usually much exceeds the glumes. The feathers of the awns are bright yellow.

## CAPE PROVINCE.

Little Namaqualand distr.: Kamiesberg, *Drège* 2544 (B); do., IX. 1911, *Pearson* 6499 (BH, K); Hondeklip Bay, X. 1924, *Pillans* 18266 (BH); between Goedemanskraal and Kaus, *Drège* (N); between Kuil and Modderfontein, *Drège* (G, S). Van Rhynsdorp distr.: near Ebenezer, *Drège* (B, K, P); Van Rhynsdorp, XI. 1923, *Rood* 789 (N); do., IX. 1900, *Diels* 527 (B). Clanwilliam distr.: Karreebergen, VII. 1896, *Schlechter* 8213 (A, B, BH, BM, G, K, N, P, T, V, W, Z); Haasdrift, IX. 1925, *Levy's* 1278 (U); without exact locality, *Leipoldt* 336 (S); *Drège* (B, O); *Morris* BH. 21792 (BH); *Thunberg* (BM).

## TYPE SPECIMEN.

Several sheets (leg. *Drège*, et *Ecklon*) together constituting the type are deposited in the Botanisches Museum, Berlin-Dahlem.

## REMARKS.

Thunberg's gathering in the British Museum consists of a specimen in which the spikelets show the presence of a well-exserted naked column. Furthermore the awns are yellow-plumose. This sheet may thus not be considered a duplicate of the type of *A. capensis* var. *genuina* Henrard.

11c. *A. capensis* Thunb. var. *Dieterleniana* H. G. Schweickerdt in Kew Bull. 1939. p. 653. a typo glumis subaequalibus extra pubescentibusque valde distincta.

The softly hairy glumes readily distinguish this variety from any of the others.

## BASUTOLAND.

Leribe distr.: Maluti Mountains, *Staples* 146 (N). Quthing distr.: Leloaleng, I. 1916, *Dieterlen* 1205 (K, N, P).

## ORANGE FREE STATE.

Ladybrand distr.: Westminster, III. 1934, *Celliers* 11 (K, N).

## TYPE SPECIMEN.

*Celliers* 11 is deposited in the National Herbarium, Pretoria.

## ECONOMIC NOTES.

This variety is reported to be unpalatable.

## REMARKS.

This variety superficially bears great resemblance to *A. sericans* Hack. with which species it might easily be confused. The lemma of the latter however is not articulated and it is thus that one may readily distinguish between these two plants.

11d. *A. capensis* Thunb. var. *barbata* Stapf in Dyer, Fl. Cap. 7. 565 (1899); Henrard Crit. Rev. 1. 77 (1926); Henrard Monogr. 1. 50 cum ic. tab. 6 (1929); Theron in Fedde, Rep. 40. 16 (1936).

This variety is characterised by possessing a hairy column of the awns, furthermore by well developed leaves which usually overtop the panicle.

## CAPE PROVINCE.

Uitenhage distr.: Near mouth of Zwartkops Rivier, *Zeyher* 4501 (B, K, N, P, V); between Kouga and Zwartkops Rivier, *Zeyher* 4501 (A, K, S, St, Z). Port Elizabeth distr.: Humewood, XI. 1907, *Rosenbrock* 671 (B); Schoenmakerskop, III. 1910, *Paterson* 989 (A); do., XI. 1907, *Rosenbrock* 627 (B); near Port Elizabeth, *Ecklon et Zeyher* 502 (BH, BM, K, O, S, V, Z); do., V. 1896, *Kemsley* 317 (A). Alexandria distr.: VIII. 1912, *Burt Davy* 14196 (N). Bathurst distr.: Port Alfred, *Hutton* 11 (A) et 11a (A, B, BH,



D, N, S, T, Z); do., X. 1916, *Tyson* BH 14877 (D, K, N, T); do., XI. 1922, *Britten* 2994 (A); do., VII. 1914, *Salisbury* 109 (WR, Z). East London distr.: East London, IV. 1903, *Galpin* 6557 (A, BH). Kentani distr.: Kei-mouth, V. 1893, *Flanagan* 1782 (BH, N, S); Gogwana River mouth, *Pegler* 265 (A, BH, N, Z). Without precise locality: *Pappe* s.n. (BM).

#### TYPE SPECIMEN.

The syn-types are all deposited in The Herbarium, Royal Bot. Gardens, Kew.

#### REMARKS.

This variety appears to have a well-defined geographic distribution, being restricted (or almost so) to the coastal areas of the Eastern Cape.

11e. *A. capensis* Thunb. var. *canescens* Trin. et Rupr. Spec. Gram. Stip. 178 (1842); Walp. Ann. Bot. 3. 751 (1852); Dur. et Schinz, Consp. 5. 801 (1894); Henrard Crit. Rev. 1. 77 (1926); Henrard Monogr. 1. 51 cum ic. tab. 6 (1929).

*A. capensis* Thunb. sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 233 (1915). *A. capensis* Thunb. var. *Zeyheri* (Nees) Walp. Ann. Bot. 3. 751 (1852); Dur. et Schinz, Consp. 5. 801 (1894); Stapf in Dyer, Fl. Cap. 7. 565 (1899); Henrard Crit. Rev. 1. 79 (1926); Henrard Monogr. 1. 51 cum ic. tab. 7 (1929). *A. Zeyheri* (Nees) Steud. Nomencl. Bot. ed. 2. 1. 132 (1841); Henrard Crit. Rev. 3. 686 (1928). *Arthratherum Zeyheri* Nees, Fl. Afr. Austr. 177 (1841).

This variety is distinguished by the hairy column up to 12 mm. long, glabrous glumes, and a panicle which is not overtopped by the leaves.

#### CAPE PROVINCE.

Clanwilliam distr.: Kardouw Krantz, XI. 1910, *Pearson* 5304 (BH, K); Malmesbury distr.: Moorreesburg, XI. 1885, *Bachmann* 870 (B, V, Z); Darling, VIII. 1883, *Bachmann* 597 (B, Z); Malmesbury, VIII. 1883, *Bachmann* 873 (B). Tulbagh distr.: Tulbagh, *Ecklon* (B); Tulbaghkloof, *Ecklon et Zeyher* 71 (77 ?) (A, N, V); Witzenberg, *Zeyher* (B). Worcester distr.: Worcester, *Rehmann* 2583 (K, Z) et 2669 (B, K, Z) et 2670 (B, V); Winterhoek, *Drège* (B); Worcester, *Zeyher* 77 (B, G); do., II. 1935, *Breda* 3 (N). Paarl distr.: Paarlberg, IV. 1830, *Drège* 8103 (B); Bain's Kloof, XI. 1896, *Schlechter* 9105 (A, B, BM, G, K, N, P, V, W, WR, Z). Hercules Pillar, VIII. 1931, *Levyms* 3175 (U). Cape distr.: Cape Town, *Burchell* 890 (K); do., VII. 1929, *Hitchcock* 24086 (W); do., XII. 1810, *Burchell* 272 (K); do., XII. 1881, *Tyson* 2392 (A); Rondebosch, II. 1816, *Bergius* 209 (B); Constantia, *Ecklon et Zeyher* 85 (G, N, V); do., XII. 1896, *Wolley Dod* 2235 (BM); Claremont, III. 1892, *Schlechter* 557 (B, P, Z); Wynberg, *Zeyher* 4502 (S) et *Zeyher* s.n. (A, S); Table Mountain, *Ecklon* 977 (K, O) et *Hitchcock* 24083 (K, N, W); Doornhoogte, *Ecklon* 72 (B, S); Camps Bay, III. 1936, *Adamson* 812 (U); Simons Bay, XII. 1852, *Milne* 255 (K) et *McGillivray* 391 (K); Eerste Rivier, XI. 1838, *Krauss* s.n. (V). Stellenbosch distr.: Somerset West, X. 1929, *Sandwith* 153 (K); Stellenbosch, *Duthie* 1646 (Sreg) et 1646a (Sreg). Caledon distr.: Houwhoek, II. 1896, *Schlechter* 7366 (A, B, BH, G, K, S, W, Z); Genadendal, XII. 1896, *Schlechter* 9843 (A, B, BH, G, K, N, P, T, W, Z); do., I. 1885, *Bolus* 7432 (B, K). Riverzondereinde, XI. 1828, *Drège* 8104 (B). Riversdale distr.: Riversdale, *Rust* 362 (B) et 363 (B) et 490 (B); do., II. 1893, *Schlechter* 2173 (B, Z); do., *Muir* 2133 (W). Uitenhage distr.: Uitenhage, *Bowie* s.n. (K); Port Elizabeth distr.: Humewood, V. 1914, *Patterson* 1095 (A). Without precise locality: *Bergius* (K); *Belanger* 153 (G); *Sieber* 129 (G); *Harvey* 298 (BM, K) et 324 (BM, K).

#### TYPE SPECIMEN.

*Bergius* s.n. is deposited in the Trinius Herbarium, Leningrad.

#### REMARKS.

The sheets enumerated under this variety by no means form a homogeneous unit. There is a great deal of variation in the length of the glumes and column of the awns.



There appears to be a gradual transition from *var. Zeyheri* to *var. canescens* and I have not been successful in distinguishing clearly between the two "varieties". For this reason a broader conception of the variety has been taken, and *var. Zeyheri* has been sunk in synonymy.

The specimens enumerated here are the more common form of the species and appear to be centred around the Cape Peninsula or in the coastal areas south-east from there.

12. **A. damarensis** Mez in Fedde, Rep. **17**. 152 (1921); Garabedian in Ann. S. Afr. Mus. **16**. II. 401 (1925); Henrard Crit. Rev. **1**. 130 (1926); Henrard Monogr. **1**. 53 cum ic. tab. 8 (1929); Theron in Fedde, Rep. **40**. 14 (1936).

*Perennial*, laxly caespitose, robust, up to 1.2 metres high, branched from near the base. Innovations intravaginal. *Culms* simple, erect, 2 mm. in diam. at the base, 3-4-noded; nodes equally distributed, slightly constricted; internodes terete, glabrous and smooth, minutely striate, exserted. Lower *leaf-sheaths* distichous and flabellate, gaping, yellow, striate, glabrous, rounded on the back, up to 6 cm. long, margins hyaline sometimes hairy; the upper leaf-sheaths much longer, up to 15 cm. long, tight, terete, striate, glabrous, minutely pubescent along the margins, scaberulous between the nerves, shorter than the internodes; *ligule* a minutely but densely ciliolate rim; auricles thickened, pubescent, those of the innovations long-bearded; *blades* of the culm-leaves very firm, almost junciform, the lower fairly short ( $\pm$  8 cm. long), the upper up to 40 cm. long, narrowly convolute, glaucous, glabrous, striate, scaberulous along the furrows beneath, upper surface scabrous, up to 3 mm. wide, narrowed into a pungent tip; blades of the innovations shorter, the margins more conspicuously pubescent above. *Panicle* sheathed at the base by the uppermost leaf, about 45 cm. long, rather narrow, contracted but not very dense or spike-like; axis subterete, deeply striate (grooved), glabrous, angular upwards; branches solitary to 3-nate, the longer ones 6-8 cm., 10-12-flowered, naked at the base, erect and adpressed, scaberulous; pedicels subclavate, shorter or slightly longer than the glumes. *Spikelets* erect, pallid or yellow. *Glumes* with an inverse position, almost glabrous, scabrous or minutely pilose towards the apex and margins; the lower 3-5-nerved, abruptly narrowed into the short mucro, 12-17 mm. long; the upper 3-nerved, the keel scabrous upwards, 12-14 mm. long, tip subacute or truncate with a short mucro. *Lemma* glabrous, including the callus about 5-6.5 mm. long; *callus* rather blunt, 1 mm. long, hairy; column of awns 5-7 mm. long; central awn densely long-plumose, obtuse in outline, without an exserted tip, 15-22 mm. long; lateral awns plumose, 9-15 mm. long. *Anthers* 5-6.5 mm. long.

#### SOUTH WEST AFRICA.

Khan-Schlucht, II. 1936, *Boss* TM. 35640 et NH. 21076 (K, N, T); Haigamkhab, I. 1907, *Galpin et Pearson* 7577 (B, K, N, S); about 30 miles from Swakopmund, XII. 1929, *Moss* 17837 (N, WR).

#### TYPE SPECIMEN.

*Galpin et Pearson* 7577 is deposited in the Botanisches Museum, Berlin-Dahlem.

13. **A. sabulicola** Pilger in Engl. Bot. Jahrb. **40**. 81 (1908); F. Bolus in Ann. S. Afr. Mus. **9**. IV. 235 (1915); Dinter in Fedde, Rep. **15**. 342 (1918); Garabedian in Ann. S. Afr. Mus. **16**. II. 404 (1925); Henrard Crit. Rev. **3**. 526 (1928); Henrard Monogr. **1**. 53 cum. ic. tab. 11 (1929); Range in Fedde, Rep. **33**. 9 (1933); Theron in Fedde, Rep. **40**. 17 (1936).

*Perennial*, very robust, tall and stiff, up to 2 metres high, from a much-branched vigorous rhizome. Subterranean branches developing in all directions, with scale-like leaves and fibrous roots at the nodes. *Culms* rigid, strictly erect, glabrous, fasciculately branched, with the branches erect; internodes included or exserted, glabrous or somewhat viscose just below or above the nodes (at the mouth of the leaf-sheaths?), sometimes with minute depressed cateriform glands?; nodes glabrous. *Leaf-sheaths* long, longer or shorter than

the internodes, tight, striate, glabrous, often with minute gland-like depressions between the nerves, the lower merely short scales; *ligule* a shortly ciliate rim; auricles pubescent or almost glabrous; collar glabrous; *blades* very rigid, thick, stiffly erect, 25–40 cm. long, often much longer, involute or complicate, junciform, very acute and pungent, terete, smooth on lower surface, hirtellous or scabrous on the upper surface, many-nerved, the margins not thickened (when flattened out) up to 5 mm. broad at the base. *Panicle* shorter than the blades, narrow, densely spiciform, 10–30 cm. long, about 1–2 cm. broad at the base; branches short, divided and spikelet-bearing nearly from the base; the lower branches up to 5 cm. long, adpressed and more or less naked at the base. *Spikelets* densely congested, yellowish. *Glumes* quite smooth, slightly unequal, subobtusate or acute; the lower 3-nerved, 8–11 mm. long; the upper 1-nerved, 9–12 mm. long. *Lemma* punctulate or smooth, including the callus 4.75–6 mm. long; *callus* pungent, very acute, curved, about 1.5 mm. long, densely bearded, especially above; column very short, 1–1.5 mm. long. Awns subequal, densely plumose to the tips, 5.5–10 mm. long, acutish in outline, the central usually somewhat longer than the lateral; branching point of awns produced into 2 thin, hairy appendages, bearing a pencil of hairs at the subobtusate tips. *Caryopsis* 4 mm. long, 1 mm. broad, spindle-shaped, anteriorly compressed; scutellum about one-third as long as the fruit.

#### SOUTH WEST AFRICA.

Rotkop, II. 1929, *Dinter* 6009 (B, BH, D, G, K, St): north of Rotkuppe Station, II. 1909, *Pearson* 4185 (BH, K); Haris, I. 1907, *Range* 174 (B) et 179 (B); Kuisebthal, IV. 1886, *Stapf* 10 et 11 (B); in the Kuiseb River at Walfishbay, VII. 1888, *Gürich* 122 (B); Rooibank near Walfishbay, *Schultze* 379 (B); Schwarzbach along Kuiseb River, VII. 1888, *Gürich* 119 (B); Anichab, II. 1907, *Range* 209 (B, K); Anichab, III. 1907, *Peyer* 248 (*Schäfer* 248) (B, N, V); Lüderitzbucht, *Peyer* s.n. (Z); Gun-Anichab, *Peyer* s.n. (Z); Lüderitzbucht, IV. 1907, *Marloth* 4741 (K); do., IV. 1907, *Range* 209a (B, N); Garub, *Schäfer* 1269 (B).

#### TYPE SPECIMEN.

The syn-types are deposited in the Botanisches Museum, Berlin-Dahlem. They are *Schultze* 379, *Gürich* 119 et 122.

#### ECONOMIC NOTES.

Used by the natives for plaiting mats. These are used to cover their huts. The mats easily imbibe moisture and thus become impervious to rain.

14. **A. Marlothii** Hack. in Engl. Bot. Jahrb. **11**. 400 (1889); Dur. et Schinz, Consp. **5**. 804 (1894); Hack. in Bull. Herb. Boiss. **4** Append. III. 19 (1896); Stapf in Dyer, Fl. Cap. **7**. 567 (1899); Henrard Crit. Rev. **2**. 334 (1927); Henrard Monogr. **1**. 82 cum ic. tab. 21 (1929); Theron in Fedde, Rep. **40**. 19 (1936).

*A. lutescens* Steud. var. *Marlothii* Stapf in Dyer, Fl. Cap. **7**. 567 (1899); Dinter in Fedde, Rep. **15**. 342 (1918); Garabedian in Ann. S. Afr. Mus. **16**. II. 403 (1925). *A. lutescens* Steud. sec. Hack. in Bull. Herb. Boiss. **4**. Append. III. 18 (1896) pro parte; Dinter in Fedde, Rep. **15**. 342 (1918) non Steud. *A. lutescens* Trin. et Rupr. sec. Engler in Engl. Bot. Jahrb. **19**. 129 (1894). *A. namaquensis* (Nees) Trin. et Rupr. sec. Garabedian in Ann. S. Afr. Mus. **16**. II. 403 (1925); Range in Fedde, Rep. **33**. 8 (1933) pro parte, non (Nees) Trin. et Rupr.

*Perennial*, strictly erect, almost suffrutescent, with a thick rhizome. Innovations intravaginal, densely sheathed at the base by firm, reduced mucronate (blades!) scales. *Culms* erect (or somewhat ascending), simple, terete, glabrous, many-noded; internodes all included, or usually the upper 1 or 2 exerted, grooved or somewhat angular just below the nodes, glabrous; nodes bearded with conspicuous white hairs. *Leaves* congested at the base of the culms, glaucous; sheaths tight, terete, the lower longer and the upper usually shorter than the internodes, somewhat striate, glabrous; *ligule* a short ciliate rim; auricles glabrous or minutely ciliate; collar glabrous; *blades* linear, acuminate, pungent,

3-7.5 cm. long, very rigid, spreading, often somewhat recurved, convolute and junciform, 1.5 mm. in diameter, glabrous and somewhat grooved beneath, puberulous on the upper surface, prominently equally 5-7-nerved. *Panicle* effuse, pyramidal, up to 25 cm. long, very lax and open; axis glabrous, angular and somewhat grooved upwards; branches filiform, glabrous, *with distinct pencils of hairs in their axils*, lower branches semi-whorled or subfascicled, often solitary, the longer branchlet in each branch 5-6-flowered, the others 2-3-flowered; pedicels glabrous, filiform, slightly thickened upwards, often flexuous or curved, as long as or longer than the glumes. *Spikelets* linear-lanceolate, yellowish or greenish. *Glumes* lanceolate, acuminate, shortly awned, glabrous, 3-nerved; the lower 10-12 mm. long, slightly scaberulous or hirtellous on the keel above; the upper from 12-14 mm. long, scaberulous upwards on the keel. *Lemma* linear-oblong, including the callus 6-8 mm. long; *callus* oblique, densely hairy, very acute, 2 mm. long; awns somewhat unequal, all plumose; column very short, about 0.5-1.5 mm. long, not twisted; central awn up to 20 mm. long, feathery to the very tip, obtuse in outline; lateral awns apparently naked, but seen under a strong lens distinctly plumose, or conspicuously so, from 12-15 mm. long. *Anthems* 4.5-5.5 mm. long.

#### SOUTH WEST AFRICA.

Near Haris, I. 1907, *Range* 181 (B); Sandfontein near Walfisbay, IV. 1886, *Marloth* 1176 (A, B, BH, K, S); Walfisbay, IV. 1905, *Schultze* 380 (B); Scheppmannsdorf, *Stapf* 13 (B); Schwarzbank along Kuiseb River, VII. 1888, *Gürich* 117 (B); Tsaukaib, XI. 1909, *Marloth* 4665 (K, N); Aus-Namib, X. 1910, *Marloth* 5002 (N); 50 Km. west of Kuibis, I. 1913, *Range* 1830 (B); Garub, III. 1908, *Kolonialamt* s.n. (B).

#### TYPE SPECIMEN.

*Marloth* 1176 is deposited in the Botanisches Museum, Berlin-Dahlem.

#### COMMON NAMES.

Goa-gras. Stechgras. Löwengras.

#### ECONOMIC NOTES.

A good but scanty foddergrass as long as the shoots are green.

15. *A. lutescens* (Nees) Trin. et Rupr. Spec. Gram. Stip. 173 (1842); Walp. Ann. Bot. 3. 750 (1852); Steud. Syn. Pl. Glum. 1. 145 (1854); Dur. et Schinz, consp. 5. 804 (1894); Hack. in Bull. Herb. Boiss. 4 Append. III. 18 (1896) pro parte; Stapf in Dyer, Fl. Cap. 7. 567 (1899) excl. syn. pro parte; Garabedian in Ann. S. Afr. Mus. 16. II. 403 (1925); Henrard Crit. Rev. 2. 316 (1927); Henrard Monogr. 1. 84 cum ic. tab. 22 (1929); Range in Fedde, Rep. 33. 9 (1933); Theron in Fedde, Rep. 40. 18 (1936).

*Arthratherum lutescens* Nees, Fl. Afr. Austr. 179 (1841); Presl, Bot. Bemerk. 121 (1844).

*Perennial*, with a creeping rhizome, covered like the base of the culms and the innovation-buds with scale-like pallid sheaths, usually much-branched. *Culms* erect, slender, fascicled, terete, glabrous and smooth, many-noded, up to 70 cm. long; internodes glabrous, terete, the upper usually exerted; nodes glabrous. Lowermost *leaf-sheaths* pallid, striate, glabrous or more or less hairy, with much-reduced blades; leaf-sheaths of the culms tight, glabrous, somewhat striate, the upper usually somewhat shorter than the internodes; *ligule* a ciliolate short rim; auricles minutely pubescent; collar glabrous; *blades* subulate, convolute and pungent, up to 12 cm. long but usually shorter, rigid, curved, spreading, glabrous and smooth beneath, puberulous and hirtellous on the upper surface. *Panicle* ovate or pyramidal, very lax and open, in depauperated specimens somewhat contracted, erect, up to 25 cm. long; rhachis smooth; branches 2-3-nate or solitary and divided nearly from the base, remotely and sparsely branched, filiform, flexuous and smooth, the axils swollen and glabrous, lower branches up to 8 cm. long, few-flowered. Pedicels smooth, curved or flexuous, rather



long, those of the lateral spikelets shorter or more rarely as long as the glumes. *Spikelets* scattered, often nodding, light green or yellowish. *Glumes* lanceolate, unequal, gradually narrowed, not awned, with an obtuse, truncate or toothed apex, glabrous, 3-nerved, the lateral nerves not or scarcely anastomosing; the lower 9–11 mm. long; the upper 11.5–14 mm. long. *Lemma* subcylindric, rounded at the base, suddenly narrowed into the callus, including the latter 6–7 mm. long; *callus* 2–2.5 mm. long, shortly hairy, very acute; column of awns 2–5 mm. long, twisted; central awn up to 2.7 cm. long, scantily hairy at the base, densely plumose to the very tip, the feathery part acutish in outline; lateral awns 9–23 mm. long, very fine, apparently glabrous but scantily and adpressedly ciliate.

#### SOUTH WEST AFRICA.

Omuramba and Omatoke, VI. 1911, *Seiner* 700 (50) (B); Scheppmannsdorf, 1885, *Stapff* s.n. (Z); Rheinpfalz, VI. 1929, *Dinter* 6413 (B, BH, D, K, N, S, St); Klinghardtgebirge, IX. 1922, *Dinter* 3944 (BH, N); do., VIII. 1913, *Schäfer* 530 (B); Obib, VIII. 1908, *Range* 589 (B).

#### CAPE PROVINCE.

Little Namaqualand distr.: At the mouth of the Orange River, X. 1830, *Drège* (727) (B, BM, G, K, N, O, P, S, V); Groot Derm, X. 1926, *Pillans* 5274 (BH, K); between Arris Drift and Anisfontein, X. 1926, *Pillans* 5245 (BH, N); Zilverfontein, *Drège* 2040 (B).

#### TYPE SPECIMEN.

*Drège* 2040 is deposited in the Botanisches Museum, Berlin-Dahlem.

16. *A. subacaulis* (Nees) Steud. Nomencl. Bot. ed. 2. **1.** 132 (1842); Trin. et Rupr. Spec. Gram. Stip. 171 (1842); Walp. Ann. Bot. **3.** 750 (1852); Steud. Syn. Pl. Glum. **1.** 144 (1854); Dur. et Schinz, Consp. **5.** 809 (1894); Hack. in Bull. Herb. Boiss. **4.** Append. III. 19 (1896) pro parte; Stapf in Dyer, Fl. Cap. **7.** 568 (1899) pro parte; Dinter in Fedde, Rep. **15.** 343 (1918) pro parte; Garabedian in Ann. S. Afr. Mus. **16.** II. 405 (1925) pro parte; Henrard Crit. Rev. **3.** 601 (1928); Henrard Monogr. **1.** 71 cum ic. tab. 18 (1929); Range in Fedde, Rep. **33.** 10 (1933); Theron in Fedde, Rep. **40.** 29 (1936).

*Arthratherum subacaulis* Nees, Fl. Afr. Austr. 180 (1841).

*Annual*, in small compact tufts, including the culms and awns up to 10.0 cm. high, but usually very much smaller. *Culms* minutely hairy, sheathed all along. *Sheaths* loose, the lowermost bladeless and resembling striate membranous scales, the upper markedly striate, scabrid above and with broad membranous margins; *ligule* a small ciliate rim, auricles bearded, collar smooth; *blades* fairly short, setaceously convolute, up to 3 cm. long, about 1 mm. wide when expanded, strongly striate, asperulous on both surfaces, acute, sub-rigid, more or less curved. *Panicle* few-flowered, much reduced, contracted, almost hidden by the radical leaves, usually somewhat sheathed by the uppermost leaf and sub-exserted; rhachis and branches hispidulous; pedicels short, hispidulous or more or less pilose at the clavate tip. *Spikelets* whitish, erect. *Glumes* linear-lanceolate, acuminate, both 3-nerved, membranous, lateral nerves about half the length of the midrib, the latter slightly scabrous towards the apex; the lower 10–13 mm. long; the upper 8–10 mm. long. *Lemma* including the callus 3–4 mm. long, lanceolate-ovate, smooth and glabrous; *callus* very acute, about  $\pm 1$  mm. long, long-hairy; length of column of awn extremely variable (even in one and the same plant), 1–13 mm. long (spikelets near the base of the panicle have shorter columns than those situated nearer the apex), twisted; central awn plumose, slightly hairy at the base, scaberulous in lower part, plumose above the middle to the very tip, up to 4.3 cm. long; lateral awns very fine, up to 1.8 cm. long. *Anthers* 4 mm. long.

#### SOUTH WEST AFRICA

Spitzkopje, I. 1937, *Boss* TM. 36368 (N, T); Richthofen, IV. 1913, *Engler* 6072 (B, K); Swakopmund, V. 1937, *Boss* TM. 36316 et 36317 (T); Arandis, I. 1937, *Boss* TM. 36395



pro parte (N, T) ; Welwitsch, I. 1907, *Galpin et Pearson* 7466 (BH, K, N, P, S) ; Walfishbay, *Nachtigal* 6 (B) ; Haalenberg, IV. 1929, *Dinter* 6301 (B, BH, D, G, K, N, S, St) ; Lüderitzbucht (Angra Pequena), X. 1884, *Schinz* 666 pro parte (Z) ; do. *Schinz* s.n. (V) ; do., XI. 1884, *Schenck* 32 (N) ; Klinghardtgebirge, VIII. 1913, *Schäfer* 528 (B) ; Namib, *Range* 1131 (B, W).

#### CAPE PROVINCE.

Little Namaqualand distr. : Near the mouth of the Orange River, X. 1926, *Pillans* 5607 (BH, K, N) ; Verleptpram, IX. 1830, *Drège* (2541) (B, BM, G, K, N, O, P, S, V) ; Richtersveld, near Arris Drift, IX. 1925, *Marloth* 12394 (N, St) et VIII. 1925, *Marloth* 12394a (N) ; do., VII. 1925, *Meyer* in Hb. Stell. 9056 (St).

#### TYPE SPECIMEN.

*Drège* from Verleptpram is deposited in the Botanisches Museum, Berlin-Dahlem.

#### COMMON NAME.

Muis-gras.

#### REMARKS.

The length of the column of the awn varies considerably, even in one and the same gathering. In *Dinter* 4104 it may be 4–13 mm., in *Dinter* 6301 from 5–10·5 mm., whereas in *Schenck* 32 it is only about 1 mm. long. In this species the length of the column is thus hardly of any taxonomic value.

17. **A. Hermannii** Mez in Fedde, Rep. **17**. 153 (1921) ; Garabedian in Ann. S. Afr. Mus **16**. II. 402 (1925) ; Henrard Crit. Rev. **2**. 225 (1927) ; Henrard Monogr. **1**. 73 cum ic tab. 18 (1929) ; Theron in Fedde, Rep. **40**. 31 (1936).

*A. Hermannii* Mez var. *hereroensis* Henrard Crit. Rev. **2**. 226 (1927) ; Henrard Monogr. **1**. 73 (1929).

*A. subacaulis* (Nees) Steud. sec. Stapf in Dyer, Fl. Cap. **7**. 568 (1899) ; Hack. in Bull. Herb. Boiss.

**4**. Append. III. 19 (1896) ; Dinter in Fedde, Rep. **15**. 343 (1918) ; omnes pro parte, non (Nees) Steud.

*Annual*, laxly caespitose, up to 15 cm. high including the awns. Sterile innovations absent. *Culms* geniculately-ascending, 2–4-noded. Internodes subterete or angular, striate, densely but minutely pubescent, exserted, the upper included. Lower *leaf-sheaths* densely aggregated, loose, white and papery, about 1 cm. long, keeled, densely striate and hirtellous, especially on the nerves, margins shortly pilose or ciliate, broad and hyaline ; upper leaf-sheaths much longer, up to 5 cm. long, very broad, inflated, loosely enveloping the internodes or part of the inflorescence, margins less ciliate, hyaline, striate and minutely scaberulous ; *ligule* a ciliate rim ; auricles bearded ; collar constricted ; *blades* of all the leaves much reduced ; the lower spirally curved and twisted, scabrous-hirtellous on both surfaces, 1–2 cm. long, about 1 mm. wide at the base or somewhat broader, apex subobtuse ; the upper curved or straight and scarcely 1·5 cm. long, convolute, much narrower than the sheaths. *Panicle* scarcely exserted, partly sheathed by the uppermost sheath, ovate-oblong, dense, up to 8 cm. long including the awns ; axis striate, subterete, scabrous-hirtellous ; branches short, solitary, divided nearly from the base ; branchlets fascicled, short ; pedicels scabrous, axils pubescent, thickened towards the apex, shorter than the glumes. *Spikelets* pallid. *Glumes* narrowly lanceolate, acute, shortly awned, 3-nerved, almost hyaline ; the lower 9–11·5 mm. long, densely but minutely scaberulous on the outer surface ; the upper 8–10 mm. long, glabrous at the base but minutely scaberulous towards the apex. *Lemma* punctulate-scabrous under a strong lens, including the callus 3·5–4 mm. long, linear-tubulous with a somewhat oblique articulation, apex minutely bi-lobed ; *callus* acute, densely hairy, about 1–1·25 mm. long ; column of awns very scabrous, twisted, pubescent at and below the branching point, extremely variable in length, from 1–10·5 mm. long even on the same specimens ; central awn scabrous in the lower third, plumose above, the tip sometimes slightly exserted but more usually not acute to subobtuse in outline, 2·4–0 cm. long ; lateral awns naked, very fine, 1–1·5 cm. long. *Anthers*  $\pm$  2 mm. long.

## ANGOLA.

Between Mossamedes and R. Coroca, IV. 1909, *Pearson* 2265 (K, N, P, Z); Mossamedes, behind the town, IV. 1909, *Pearson* 2286 (K, N).

## SOUTH WEST AFRICA.

Arandis, I. 1937, *Boss* TM. 36395 pro parte (T); between Swakopmund and Walfishbay, *Boss* TM. 36439 (N, T); Lüderitzbucht (Angra Pequena), X. 1884, *Schinz* 665 et 666 (Z); do., XI. 1884, *Schenck* 32 (N, Z); do., *Schenck* s.n. (V); do., XI. 1889, *Hermann* 42 (B); Pomona, V. 1929, *Dinter* 6344 (BH, N) et *Dinter* 6396 (B, BH, D, G, K, N, S, St); Hereroland, *Nels* s.n. (V).

## TYPE SPECIMEN.

*Hermann* 42 is deposited in the Botanisches Museum, Berlin-Dahlem.

## REMARKS.

In this species the column of the awn is extremely variable as to its length. *Dinter* 6344 has spikelets in which the column is only 1 mm. long, whereas in *Pearson* 2265 the column varies from 3-10.5 mm. in length.

18. **A. geminifolia** (Nees) *Trin. et Rupr.* Spec. Gram. Stip. 169 (1842); Walp. Ann. Bot. 3. 749 (1852); Steud. Syn. Pl. Glum. 1. 144 (1854) [sphalm. geminiflora]; Dur. et Schinz, Consp. 5. 803 (1894); Stapf in Dyer, Fl. Cap. 7. 570 (1899); Dinter in Fedde, Rep. 15. 341 (1918); Garabedian in Ann. S. Afr. Mus. 16. II. 402 (1925) pro parte; Henrard Crit. Rev. 1. 194 (1926); Henrard Monogr. 1. 66 cum ic. tab. 16 (1929); Range in Fedde, Rep. 33. 8 (1933); Theron in Fedde, Rep. 40. 26 (1936) [sphalm. geminiflora].

*Stipagrostis geminifolia* Nees, Fl. Afr. Austr. 173 (1841); Presl, Bot. Bemerk. 121 (1844).

*Perennial*, densely caespitose, branched from the base, almost suffrutescent, up to 25 cm. high including the awns. *Culms* erect or ascending, slender, glabrous or hairy below the panicle, rather few-noded, simple, terete, striate; internodes very unequal, markedly striate; the lower short, sheathed, included; the following long exserted, up to 12 cm. long; the next short to very short, 5-20 mm. long, enclosed or exserted; the last slightly longer or equalling the former in length and usually shortly exserted, often geniculate. Innovations intravaginal with a similar alternation of short and long internodes; nodes bearded or becoming glabrous with age. *Leaves* crowded near the base, the uppermost again approximate, sometimes subopposite; sheaths short, striate with much reduced leaf-blades, the lower tight and parched, glabrous, with woolly or ciliate margins, the upper less tight and almost spathe-like, sometimes slightly hirsute with tubercle-based hairs; *ligule* a ciliolate rim; auricles bearded; collar glabrous; blades short, almost rudimentary, subulate, involute, subpungent, 3-10 mm. long, rarely longer, very rigid and divaricately spreading, striate and glabrous below, pubescent on the upper surface. *Panicle* sub-erect or somewhat nodding, very short, spike-like and often secund, including the awns up to 4 cm. long and 2.5 cm. broad; rhachis glabrous or hairy, branched from near the base; branches hairy; pedicels hairy, very short, almost sessile. *Spikelets* crowded and congested yellowish-brown and tinged with purple. *Glumes* unequal, linear-lanceolate, acuminate, long-awned, the tips of both convolute and slightly bifid, but the setulae inconspicuous; the lower 8-12 mm. long, hirsute all over, manifestly 3-nerved; the upper 10-12 mm. long, narrower, more or less glabrous at the base, hirsute above, 1-3-nerved. *Lemma* including the callus 4-6 mm. long, linear-oblong, smooth, pale or purplish, minutely bilobed; *callus* about 1.5 mm. long, very acute, densely hairy; column of awn 1-2 mm. long, slightly twisted; central awn spreading, 18-30 mm. long, plumose, lower part shortly hairy, upper part long feathery to the very tip, obtuse in outline; lateral awns naked, up to 15 mm. long. *Pale* emarginate, 2-nerved, 1 mm. long. *Anthers* 3-4 mm. long.

## SOUTH WEST AFRICA.

Namib, Kuos, IX. 1913, *Range* 1874 (B); Haalenberg, X. 1922, *Dinter* 4099 (B, BH, N, Z); Lüderitzbucht, VII. 1922, *Dinter* 3829 (BH, N); Pomona, V. 1927, *Dinter* 6365 (B, BH, D, G, K, N, S, St); Zwischen Prinzenbucht und Bogenfels, IX. 1912, *Schäfer* 587 (B); near Bogenfels, VIII. 1911, *Marloth* 12987 (N); Buntfeldschuh, VII. 1913, *Schäfer* 524 (B); Obib, VIII. 1908, *Range* 586 (B); without precise locality, *Kuhn* s.n. (B).

## CAPE PROVINCE.

Little Namaqualand distr.: At the mouth of the Orange River, *Drège* (B, BM, G, N, O, S); between Kaus, Natvoet and Doornpoort, *Drège* (B, P, V); near Orange River mouth, X. 1926, *Pillans* 5606 (BH, K, N); Richtersveld, IX. 1925, *Marloth* 12415 (N, St).

## TYPE SPECIMEN.

*Drège* 2561 is deposited in the Botanisches Museum, Berlin-Dahlem.

19. *A. fastigiata* Hack. *apud* Schinz in Bull. Herb. Boiss. Ser. II. 1. 768 (1901); *Dinter* in Fedde, Rep. 15. 341 (1918); Henrard Crit. Rev. 1. 175 (1926); Henrard Monogr. 1. 67 cum ic. tab. 15 (1929); Theron in Fedde, Rep. 40. 27 (1936).

*A. geminifolia* (Nees) Trin. et Rupr. sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 234 (1915); Garabedian in Ann. S. Afr. Mus. 16. II. 402 (1925) omnes pro parte, non (Nees) Trin. et Rupr.

*Perennial*, fairly densely caespitose, with a much-branched thick rhizome. *Culms* arising in fascicles at intervals from the rhizome, elegant, erect or somewhat geniculately ascending, 4-5-noded, up to 35 cm. high, sheathed all along, simple, terete; internodes more or less equal in length, exserted, only slightly striate, laterally sulcate, somewhat scaberulous; nodes annular, densely bearded with long spreading white hairs. *Leaf-sheaths* (except the lowermost) much shorter than the internodes, terete, tight, striate, only slightly scabrous, with ciliate margins; *ligule* a shortly ciliate rim; auricles densely divaricately bearded; collar glabrous; blades linear-lanceolate, acute, gradually narrowed into a setaceous point, more or less curved, flat at the base and 2-3 mm. wide, convolute upwards, up to 12 cm. long, but usually much shorter, many-nerved, margins not thickened, scaberulous beneath, pubescent or densely hirtellous on the upper surface. *Panicle* well-exserted, more rarely sheathed by the uppermost leaf, slightly nodding or erect, more or less obovate, dense, few to many-flowered, subsecund and subfastigiate, including the awns up to 8 cm. long; axis striate, scaberulous; branches scabrous, solitary, scarcely 5 mm. long, bearded in the axils; pedicels very short, hairy. *Spikelets* congested, greenish-white, often darker (brown) at the base. *Glumes* unequal, 3-nerved, hairy all over, the tips more or less glabrescent; the lower 10-14 mm. long, acute; the upper 14-18 mm. long, acuminate, with a minutely bifid apex and inrolled tips. *Lemma* oblong, smooth, bilobed at the apex, 5-5.5 mm. long including the callus; *callus* 1.5-2 mm. long, densely hairy, very acute; central awn 3-3.5 cm. long, feathery all over, obtuse in outline; lateral awns naked, 1-2 cm. long. *Anthers* 5 mm. long.

## SOUTH WEST AFRICA.

Namib, VI. 1936, *Boss* TM. 36148 (K, N, T); 12 km. west of Sandverhaar, II. 1909, *Pearson* 4600 (A, BH, BM, D, K, N, S); Inachab, XI. 1898, *Dinter* 1102 (B, N, V, W, Z); between Kalkfontein and Nakob, I. 1916, *Pearson* 9709 (BH, K, S).

## TYPE SPECIMEN.

*Dinter* 1102 is deposited in the Botanisches Museum, Zürich.

## REMARKS.

This species is closely related to *A. geminifolia* but is characterised by having the internodes more uniform in length and well-developed leaf-blades. In *A. geminifolia* the upper two leaf-sheaths are approximate and leaf-blades are almost totally wanting; the spikelets are more robust and larger than in *A. fastigiata*.



20. *A. hirtigluma* Steud. ex Trin. et Rupr. Spec. Gram. Stip. 171 (1842); Steud. Nomencl. Bot. ed. 2. 131 (1841) nomen tantum; Hack. in Bull. Herb. Boiss. 4. Append. III. 18 (1896); Henrard Monogr. 1. 68 cum ic. tab. 15 (1929).

*Arthratherum ciliatum* Nees, Fl. Afr. Austr. 182 (1841) excl. syn.

Delicate annual, caespitose. Culms up to 40 cm. long, 2–4-noded, glabrous; internodes terete and striate, usually scaberulous; nodes glabrous. Leaf-sheaths shorter than the internodes, striate, scabrous, somewhat compressed; ligule shortly ciliate; auricles long-bearded; collar glabrous; blades 6–15 cm. long, setaceous, convolute, scaberulous on the lower surface, upper surface somewhat hairy, especially towards the ligule. Spikelets pale, hirtellous. Glumes unequal to subequal; the lower up to 6 mm. long, ciliate dorsally; the upper up to 10 mm. long, dorsally ciliate. Lemma including the callus up to 4 mm. long or slightly longer, tuberculate; callus long and sharp, somewhat oblique; column of awns up to 10 mm. long, hairy or glabrous; central awn very long (up to 5–7 cm.), feathery with a naked excurrent tip; lateral awns about 1–1.5 cm. long.

ANGOLA.

Loanda, Gossweiler 4943 (K, N).

SOUTH WEST AFRICA.

Rehoboth, VI. 1889, Fleck 802 (V, Z). Bethanie, IV. 1933, Van Son TM. 31827 (T); Usakos, XII. 1938, Volff 150 (D).

TYPE SPECIMEN.

Schimper 165 is deposited in the Botanisches Museum, Berlin-Dahlem.

21. *A. gracilior* Pilger in Engl. Bot. Jahrb. 40. 80 (1907); Dinter in Fedde, Rep. 15. 341 (1918); Henrard Crit. Rev. 1. 208 (1926); Henrard Monogr. 1. 69 cum ic. tab. 15 (1929).

*A. hirtigluma* Steud. var. *patula* Hack. in Denkschr. Kais. Akad. Wiss. Wien, Math.—Naturw. Kl. 78. 401 (1906). *A. hochstetteriana* Beck ex. Hack. sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 234 (1915) pro parte, non Beck. *A. uniplumis* Licht. sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 234 (1915) pro parte, non Licht.

Perennial, erect, caespitose. Culms up to 100 cm. high including the panicle, frequently much smaller, 4–5-noded, at times branched upwards. Internodes terete, striate, glabrous but scaberulous along the nerves, exserted; nodes glabrous, somewhat swollen. Leaf-sheaths shorter than the internodes, tight or somewhat lax upwards, subcompressed, striate and asperulous; ligule a short ciliate rim; auricles densely bearded; blades erect or more or less flexuous or curved, narrow, convolute, filiform, acuminate, asperulous and grooved below, upper surface scaberulous to hirtellous, up to 20 cm. long or more. Panicle lax, ovate in outline, up to 30 cm. long and 20 cm. wide; axis terete, angular and asperulous upwards; branches thin, elongate, solitary, often divided from near the base, scabrous; pedicels capillary, much thickened towards the apex. Spikelets pale yellow to green or purple-brown. Glumes unequal, subacute, more or less shortly awned, hirtellous; the lower 9–11 mm. long; the upper 10–13 mm. long. Lemma including the callus about 3.5 mm. long, becoming very dark at maturity, tuberculate-asperulous upwards; callus 0.5–0.75 mm. long, curved, acute, densely bearded; column of awns 7–11 mm. long, hairy upwards; central awn up to 5.5 cm. long, plumose except for the naked tip; lateral awns up to 25 mm. long. Anthers 4–5 mm. long.

SOUTH WEST AFRICA.

Onolongo, Barnard 42 (S); Klein Namutoni, I. 1919, Breyer TM. 20614 (T); between Klein Otavi and Okorosawe, III. 1926, Barnard (S); Grootfontein, IV. 1916, Waibel 100 (B); do., I. 1936, Boss TM. 35691 (T); Otavi, I. 1936, Von Malzahn TM. 35560 (T); Outjo, V. 1933, ter Horst TM. 31843 (T); Waterberg, I. 1937, Boss TM. 36456 (T); Omaruru,



XII. 1935, *Boss* TM. 35670 (T); Okahandja, II. 1928, *Bradfield* 268 pro parte (T); Granitbank bei Ebony, V. 1936, *Boss* TM. 36191 (T, K); Welwitsch, Khan River basin, III. 1909, *Pearson* 4468 (K); Walfishbay, IX. 1925, *de Wildeman* (K); Mount Brukkaros, III. 1931, *Sordahl* 26 (W); Sandverhaar, II. 1909, *Pearson* 4673 (K); between Keetmanshoop and Seeheim, II. 1909, *Pearson* 4673 (BH, K); Tsirub, V. 1936, *Boss* TM. 36229 (T); Klein Karas, IV. 1931, *Oertendahl* 140 (N); Karas Mountains, *Boss* TM. 36126 (T); without precise locality, *Empire Exhibition* 29 (K, W); Bumbo, im Walde, IV. 1903, *Fritzsche* 16 (B, G, N, V); Hairabib, IV. 1939, *Volk* 485 (D); Ossa, III. 1939, *Volk* 1531 (D).

#### BECHUANALAND PROTECTORATE.

Makarikari Lake, IV. 1931, *Pole Evans* 3274 et 3284 (K, N); Francistown, V. 1929, *Gordon* 146 (N); between Francistown and Shashi, IV. 1931, *Pole Evans* 3224 (K, N),

#### CAPE PROVINCE.

Little Namaqualand, Koa Vallei, Aggeneys, I. 1909, *Pearson* 4953 (K).

#### TYPE SPECIMEN.

*Fritzsche* 16 is deposited in the Botanisches Museum, Berlin-Dahlem.

#### ECONOMIC NOTE.

Collectors from South West Africa state that this species is a good fodder for stock.

#### 21a. *A. gracilior* Pilger var. *intermedia* mihi,

a typo columna apice penicillata et arista media basin versus nuda differt.

#### SOUTH WEST AFRICA.

Keetmanshoop, IV. 1931, *Oertendahl* 158 (K, N); Damaraland, I. 1907, *Galpin* et *Pearson* 7402 (K, N).

#### TYPE SPECIMEN.

*Galpin* et *Pearson* 7402 is deposited in the Herbarium, Royal Bot. Gardens, Kew.

The facies of this variety is identical with that of the species but may be distinguished by the penicillate branching point of the awn (as in *A. uniplumis* Licht.) and the naked column.

#### 21b. *A. gracilior* Pilger var. *Pearsonii* Henrard Crit. Rev. **3**. 695 (1938); Henrard Monogr. **1**. 69 (1929).

#### ANGOLA.

Between Mossamedes and R. Coroca, IV. 1909, *Pearson* 2249 (K, N); about 100 km. from Mossamedes, IV. 1909, *Pearson* 2395 (K); Cautas on Mossamedes Railway, IV. 1909, *Pearson* 2361 (K).

#### SOUTH WEST AFRICA.

Grootfontein, II. 1933, *Schoenfelder* 70 (K, N); Narebis, *Barnard* SAM. 16479-80 (K, S); Spitzkopje, I. 1937, *Boss* TM. 36357 (T) et 36371 (T) et 36374 (T); Arandis, I. 1937, *Boss* TM. 36396 (T).

#### TYPE SPECIMEN.

*Pearson* 2249 is deposited in The Herbarium, Royal Bot. Gardens, Kew.

The facies of this variety resembles that of the species but may be recognised by the naked column and the absence of a pencil of hairs at the branching-point of the awns.

22. *A. obtusa* Del. Fl. Aegypt. 31 tab. 13 fig. 3 (1813); Trin. Spec. Gram. Stip. 167 (1842); Walp. Ann. Bot. 3. 749 (1852) excl. syn. pro parte; Steud. Syn. Pl. Glum. 1. 144 (1854); Dur. et Schinz, Consp. 5. 805 (1894); Stapf in Dyer, Fl. Cap. 7. 567 (1899) excl. syn. pro parte; F. Bolus in Ann. S. Afr. Mus. 9. IV. 233 (1915) pro parte; Marloth, Fl. S. Africa 4. 22 tab. 7 fig. A 1-4 (1915); Dinter in Fedde, Rep. 15. 342 (1918); Garabedian in Ann. S. Afr. Mus. 16. II. 403 (1925) pro parte; Henrard Crit. Rev. 2. 387 (1927); Henrard Monogr. 1. 72 cum ic. tab. 17 (1929); Range in Fedde, Rep. 33. 9 (1933).  
*A. brevifolia* Steud. sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 234 (1915) pro parte, non Steud. *A. ciliata* Desf. sec. Stapf in Dyer, Fl. Cap. 7. 564 (1899) pro parte, non Desf. *A. Dregeana* (Nees) Trin. et Rupr. sec. Hack. in Bull. Herb. Boiss. 4. Append. III. 18 (1896); Stapf in Dyer, Fl. Cap. 7. 570 (1899); Dinter in Fedde, Rep. 15. 341 (1918); Garabedian in Ann. S. Afr. Mus. 16. II. 401 (1925) omnes pro parte, non (Nees) Trin. et Rupr. *A. uniplumis* Licht. sec. Hack. in Bull. Herb. Boiss. 4. Append. III. 19 (1896) pro parte, non Licht. *A. sp.* sec. Bolus in Ann. S. Afr. Mus. 9. IV. 235 (1915). *Arthratherum obtusum* (Del.) Nees, Fl. Afr. Austr. 179 (1841); Presl, Bot. Bemerk. 121 (1844). *Stipagrostis capensis* Nees in Linnaea 7. 291 (1832); Kunth Enum. 1. 197 (1833); Nees, Fl. Afr. Austr. 171 (1841). *Stipagrostis obtusa* Nees in Linnaea 7. 293 (1832); Kunth Enum. 1. 198 (1833).

*Perennial*, compactly caespitose. Innovations numerous. *Culms* from a few centimetres up to 50 cm. high, very slender, 1-noded, glabrous, smooth, erect or geniculate at the nodes; internodes exserted. Lower *leaf-sheaths* short, firm and persistent, glabrous or woolly near the margin, with more or less reduced blades; the upper much shorter than the internode, tight, striate, often somewhat compressed, with hyaline margins, some times lightly villous; *ligule* a short ciliolate rim; auricles densely and often very long-bearded; collar smooth; blades very variable with regard to length, 1.5-20 cm. long, setaceous, convolute, rigid or subrigid, curved or flexuous, glaucous, striate, glabrous or lightly villous or scaberulous beneath, minutely villous or hirtellous on the upper surface, scarcely 0.5 mm. wide when expanded, terminating in a callus-like obtuse tip. *Panicle* very narrow, erect, contracted, but rather loose and interrupted at the base, 2.5-20 cm. long; axis terete or striate, glabrous or scaberulous upwards; branches solitary, bipartite nearly from the base, filiform, erect or somewhat spreading; branchlets scaberulous, axils glabrous; lateral pedicels short, always shorter than the glumes. *Spikelets* yellow, often flushed with purple at the base. *Glumes* sub-equal, *scaberulous dorsally with numerous rows of fine protuberances*; the lower lanceolate, obtuse, 3-nerved, scabrous on the keel, usually exceeding the upper glume in length, 8.5-12 mm. long; the upper narrowly-lanceolate, subacute, 1-3-nerved, smooth on the keel, 8-11 mm. long. *Lemma* oblong, about 3 mm. long including the callus, smooth; *callus* nearly 1 mm. long, acute, densely hairy; column of awns variable in length, 4-10 mm. long, straight or twisted; central awn scaberulous in lower half, densely plumose in upper part up to the very tip, about 2-3.2 cm. long; lateral awns naked, very fine, divaricate, 0.75-1.75 cm. long. *Pale* nerveless, broad,  $\pm$  1 mm. long. *Anthers* 4-5 mm. long.

#### SOUTH WEST AFRICA.

Spitzkopje, I. 1937, Boss TM. 36376 (T); Arandis, I. 1937, Boss TM. 36397 (T); Welwitsch, I. 1907, *Galpin et Pearson* 7415 (BH, K, N, P, S); Haigamkhab, I. 1907, *Galpin et Pearson* 7424 (K, N, S); Usakos, anno 1938, Volk 73 (D); Rössingberge, XI. 1938, Volk 23a (D); Witvley, Range 1422 (B); between Choaherib and Gurumanas, I. 1916, *Pearson* 9598 (BH, K, S); Kwartel, IV. 1911, *Dinter* 2166 et 2171 (B); Narib, IV. 1913, *Engler* 6533 (B); Tsumis, III. 1905, *Von Trotha* 15b (B); Sendlingsgrab, I. 1908, *Hartmann* 17a (B); Gamkanas, III. 1911, *Dinter* 2001 (B); Lidfontein, III. 1911, *Dinter* 1999 (B); Bullsporter Fläche, *Dinter* 2137 (B, W); between Gamis and Bull's Mouth Pass, XII. 1915, *Pearson* 8939 (K, S); Chamisfläche, IX. 1905, *Schultze* 414 (B); Gelwater, X. 1907, *Hartmann* 17 (B); between Achterfontein and Gelwater, XII. 1915, *Pearson* 9229 (K); 20 km. south of Gründoorn, II. 1909, *Pearson* 3158 (K); between Ausis and Khuias, III. 1885, *Schenck* 219 (Z); Haalenberg, IV. 1929, *Dinter* 6303 (B, BH, K, St); Keetmanshoop, *Seidel* 2 (B); Lüderitzbucht (Angra Pequena), *Marloth* 5084b (N); do., VII. 1925, *Moss* 11516 pro parte (WR); Garub, I. 1910, *Dinter* 1056 (B); do., Range 523 (B); do., II.

1909, *Pearson* 4197 (K, S); Aus, III. 1885, *Schinz* 659 (B, K, Z); do., *Peyer* 26 (Z); do., *Marloth* 5084 (N, St); near Kubib, I. 1916, *Pearson* 9472 [an 9492 ?] (K, S) et 9476 (K); Kubub, *Range* 234 (B); Schakalskuppe, *Range* 1780 (B); do., II. 1909, *Pearson* 4804 (BH, K, N) et 4778 (A, BM, K, S); Buchholzbrunn, II. 1909, *Pearson* 3639 (K, Mc); Feldschuhhorn, IV. 1909, *Schäfer* 105 (B); Sandverhaar, II. 1909, *Pearson* 4663 (K); do., *Pearson* 4676 (D, K, N); do., *Pearson* 4688 (A, K); Kaukasib, *Range* 1133 et 1897 (B); Inachab, XII. 1897, *Dinter* 1109 (B, V, Z); Klein Karas, IV. 1931, *Oertendahl* 119 (N); do., VII. 1931, *Oertendahl* 563 (B); do., IX. 1923, *Dinter* 4952 (B, BH, G, K, Mc, N, S, Z); Pomona, *Marloth* 6595 (N); Holoog, I. 1916, *Pearson* 9725 (BH, K, S); Kraaikluft, XII. 1912, *Pearson* 8494 (A, BH, BM, K, N, S); Klinghardtgebirge, VIII. 1913, *Schäfer* 542-545 et 547 [omnes B]; Witputz, *Range* 587 et 713 (B); Narudas Süd, XII. 1912, *Pearson* 8146 (BH, K); Ganus, II. 1909, *Pearson* 4504 (K); Aiais-plateau, V. 1919, *Waibel* 203 (B); Gabis, I. 1909, *Pearson* 4322 (K, N); 25 km. north of Warmbad, II. 1909, *Pearson* 4292 (K, W, Z); Dabaigabis, I. 1909, *Pearson* 4382 (D, K, N); Hohenfels, *Pfeil* 184 (B); near Raman's Drift, I. 1909, *Pearson* 4009 (A, BH, BM, K, N, S); do., *Pearson* 4053 (A, BH, K, S); north of Viols Drift, IX. 1931, *Pillans* 6396 (BH); without precise locality: Hereroland, *Lüderitz* 64 et 68 (B, Z); Namib, *Morgenstern* s.n. (B).

#### CAPE PROVINCE.

Little Namaqualand distr.: South of Orange River mouth, IX. 1926, *Pillans* 5707 (BH, K); south of Viols Drift, III. 1935, *Thorne* SAM. 51590 (S); Richtersveld, VIII. 1925, *Marloth* 12223 (N); between Holgat River and Orange River, *Drège* 2542 (B, K, N, S); Goodhouse, IX. 1930, *Henrici* 2195 (N); Lekkersing, IX. 1935, *Taylor* 1095 (N); Steinkopf, V. 1926, *Krapohl* H. 21862 (B, N) et *Marloth* 11222 (N) et *Marloth* 3719 (N); Kraaiwater, II. 1898, *Schlechter* 64 (A, B, BH, G, K, N, P, T, V, W, Z); Windhoek, VII. 1896, *Schlechter* 8343 (A, B, BH, BM, G, K, N, P, T, V, W, Z); Koeris Camp, X. 1928, *Pole Evans* 2238 (N); between Klipfontein and Abbevlakte, *Bolus* 9468 (BH); Buffelsriver, IX. 1897, *Schlechter* 11254 (A, B, BH, BM, G, K, N, P, T, V, W, Z); near Kamabies, XII. 1908, *Pearson* 3777 (K); near Bitterfontein, XII. 1908, *Pearson* 3866 (K); Ius, IX. 1897, *Schlechter* 11405 (A, B, BH, BM, G, K, N, P, Z); south of Daunabis, XII. 1910, *Pearson* 6006 (A, K, S); Alewynsfontein, XII. 1908, *Pearson* 3334 (BM). Van Rhynsdorp distr.: Bitterfontein, XII. 1908, *Pearson* 3406 (N, T). Calvinia distr.: Between Lospers Plaats and Springbokkuil River, *Zeyher* 1815 (A, B, BH, BM, G, K, P, S, V, Z); Brakrivier, XII. 1908, *Pearson* 3902 (BH, K); between Pappekuul and Stompiesfontein, XII. 1908, *Pearson* 4965 (K). Ceres distr.: Rietpoort, *Rehmann* 3266 (Z); Gansfontein, XII. 1908, *Pearson* 3987 (K). Sutherland distr.: Tanqua Karroo, IX. 1935, *Levy's* 5087 (U). Laingsburg distr.: Ngaap Kop, IX. 1926, *Compton* 3140 (BH). Prince Albert distr.: Prince Albert Road, I. 1903, *Marloth* 3055 (N); do., V. 1920, *Pillans* BH. 21798 (BH); Boterkraal, XI. 1905, *Bolus* 12431 (A, B, BH, BM, K, N); Beaufort West distr.: Nieuweveld, Bokpoort, *Drège* (B, G, K, N, P, S, V). Murraysburg distr.: Murraysburg, VIII. 1879, *Tyson* 526 (D). Graaff-Reinet distr.: Graaff-Reinet, IV. 1911, *Pillans* 1812 (K). Victoria West distr.: Victoria West, XI. 1923, *Marloth* 3075 (N). Carnarvon distr.: Carnarvon, IX. 1925, *Gill* 215 (St); Karreebergen Poort, IX. 1811, *Burchell* 1556 (G, K). Fraserburg distr.: Williston, XI. 1921, *Foley* 188 (N); between Patrysfontein and Great Brak River, *Burchell* 1520 (K, P); between Great Riet River and Stinkfontein, VIII. 1811, *Burchell* 1392 (G, K, N, P); Fraserburg, II. 1930, *Nel* in Hb. Stell. 15842 (St). Kenhardt distr.: Loog Kolk, X. 1928, *Pole Evans* 2237 (N); Louisvale, II. 1930, *Mennell* s.n. (W). Prieska distr.: Prieska, III. 1931, *Bryant* 608 (B, K, V, W); Redlands Siding, IV. 1913, *Crews* GH. 9071 (N). Philipstown distr.: Potfontein, III. 1933, *Schweickerdt* 1205 (N). Herbert distr.: Honeynestkloof, III. 1920, *Wilman* K. 2 (B, K); do., V. 1921, *Wilman* 2153 (Mc) do., XI. 1929, *Phillips* 3466 (K, N, W). Kimberley distr.: Modderriver Station, II. 1904 *Kuntze* s.n. (K); Riverton, IV. 1928, *Wilman* 2923 (Mc); Kimberley, *Rehmann* 3469 (Z) et *Tuck* s.n. (K, S). Hay distr.: Niekerk's Hoop, X. 1936, *Hafstrom* 1150 (Mc); Griquatown, II. 1937, *Wilman* s.n. (K, Mc). Gordonia distr.: Upington, IX. 1919, *Shantz* 184 (K, W); Brak River, VII. 1925, *Barnard* SAM. 36144 (S). Kuruman distr.: Kuruman,



III. 1928, *Pole Evans* 2089 (N). Vryburg distr.: Armadillo Creek, V. 1912, *Burt Davy* 13862 (N). Mafeking distr.: Inkruij, IV. 1929, *Pole Evans* 2422 (K, N); Kameelboom Camp, IV. 1929, *Pole Evans* 2405 (K, N).

#### ORANGE FREE STATE.

Fauresmith distr.: Jagersfontein, VI. 1927, *Smith* 4114 (K); Fauresmith, I. 1925, *Pole Evans* 1572 (N); Luckhoff, I. 1917, *Pole Evans* H. 135711 (N). Bloemfontein distr.: Pont 948 (Z); without precise locality: Olifantsfontein, *Rehmann* 3525 (B, K, V, Z).

#### TYPE SPECIMEN.

The type is deposited in the Institut de Botanique, University of Montpellier, France.

#### COMMON NAMES.

Beesgras. Bushman Grass. Fyne Twaagras. Gemsbokgras. Klein Twaagras. Klip Toagras. Small Bushman grass. Toagras(s). Twaagras.

#### ECONOMIC NOTES.

Many collectors report that this species is a good fodder for all kinds of stock and in some parts of South West Africa is one of the most important pasture grasses. It is very tough and lasts well (persists).

23. *A. brevifolia* (Nees) Steud. Nomencl. Bot. ed. 2. 130 (1842); Trin et Rupr. Spec. Gram; Stip. 170 (1842); Walp. Ann. Bot. 3. 749 (1852); Steud. Syn. Pl. Glum. 1. 144 (1854); Hack. in Bull. Herb. Boiss. 4. Append. III. 17 (1896); Stapf in Dyer, Fl. Cap. 7. 570 (1899); F. Bolus in Ann. S. Afr. Mus. 9. IV. 234 (1915) pro parte; Dinter in Fedde, Rep. 15. 341 (1918); Garabedian in Ann. S. Afr. Mus. 16. II. 401 (1925); Henrard Crit. Rev. 1. 58 (1926); Henrard Monogr. 1. 74 cum ic. tab. 17 (1929); Range in Fedde, Rep. 33. 8 (1933); Theron in Fedde, Rep. 40. 12 (1936).

*A. geminifolia* Trin. et Rupr. sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 234 (1915) pro parte, non Trin. et Rupr. *A. obtusa* Del. sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 233 (1915) pro parte, non Del. *Arthratherum brevifolium* Nees, Fl. Afr. Austr. 183 (1841).

*Perennial*, suffrutescent, with a much-branched woody rootstock. *Culms* up to 100 cm. high, but usually much shorter, many-noded, erect or ascending, terete, striate, slender, minutely puberulous and covered with many glands; lower internodes short, more or less aggregated, the upper gradually longer and exserted; nodes with an evanescent flake of wool. *Leaf-sheaths* tight; the lower longer or slightly shorter than the internodes, terete, striate, gland-dotted, covered with evanescent wool at the mouth and along the margins, those of the short cylindric innovations very broad and with rudimentary spiny blades; the upper sheaths much longer, shorter than the internodes, glandular or becoming more or less glabrescent; *ligule* a short ciliate rim; auricles bearded with a flake of wool; collar a more or less pubescent villous line, eventually becoming glabrous; *blades* densely striate, convolute or flat, subpungent, subrigid to very rigid, spreading, glaucous, asperulous beneath, glandular hispidulous or pubescent on the upper surface, up to 12 cm. long but usually much shorter, up to 3 mm. broad. Inflorescence exserted; peduncle terete, striate, puberulous and glandular. *Panicle* contracted, linear, somewhat spike-like but loose and interrupted at the base, up to 20 cm. long including the awns but usually much shorter; rhachis striate, angular, glabrous, here and there dotted with glands; branches short, divided from the base, usually few-flowered, smooth; pedicels shorter or longer than the glumes. *Spikelets* green or yellowish, often tinged with purple. *Glumes* lanceolate, acuminate, minutely truncate, glabrous or puberulous or ciliate near the margins and glandular, unequal; the lower 8–11 (15) mm. long; the upper 11·5–15 (17) mm. long, 3–5-nerved. *Lemma* linear-oblong, smooth, with an obtusely slightly bilobed tip, including the callus 5·5–7 mm. long; *callus* very acute, pungent, up to 2–2·5 mm. long, long-hairy; column twisted, 4–9 mm. long; central awn glabrous or scantily plumose at the base, densely plumose above to the very tip, obtuse in outline, 2·3–4·0 cm. long; lateral awns naked, 1·0–1·8 cm. long. *Anthers* up to 7 mm. long.



## SOUTH WEST AFRICA.

Between Keetmanshoop and Seeheim, II. 1909, *Pearson* 4590 (B, BM, BH, K, N); Klein Karas, IX. 1923, *Dinter* 4970 (BH, G, Mc, N, S, St, Z); Klein Karas to Aiais, VII. 1931, *Oertendahl* 575 (K, N); between Fish River and Orange River, XII. 1911, *Range* 1233 (B); Aiais-plateau, V. 1919, *Waibel* 202 (B); between Sjambok River and Aussenkehr, IX. 1931, *Pillans* 6469 (BH); between Modder Drift and Sjambok River, IX. 1931, *Pillans* 6444 (BH); 25 km. north of Warmbad, II. 1909, *Pearson* 4287 (K, WR, Z); 30 km. north of Raman's Drift, I. 1909, *Pearson* 4051 (BH, K, S) et 4010 (A, BH, D, K) et 4535 (K); without precise locality, *Fleck* 290a (V, Z).

## CAPE PROVINCE.

Little Namaqualand distr.: Goodhouse, Orange River, IX. 1930, *Henrici* 2152 (N); between Dabainoris and Abbases, I. 1909, *Pearson* 3011 (K, D); Wortel, I. 1909, *Pearson* 3601 (A, BM, K, N, T, S) et 3626 (K) et 3632 (K, N) et 3634 (BM, N); 10 miles north-east of Bitterfontein, XII. 1908, *Pearson* 3405 (A, BM, BH, K, N, S); Silverfontein near Ookiep, X. 1830, *Drège* [2040] (B, G, K, N, O, P, V); near Springbok, XII. 1936, *Adamson* 1538 (K); Buffel Rivier, IX. 1897, *Schlechter* 11255 (A, B, BH, BM, G, K, N, P, T, V, W, Z); near Tweefontein, XII. 1908, *Pearson* 3781 (K); between Klipplaat and Bitterfontein, XII. 1908, *Pearson* 3869 (K); Zabies, XII. 1897, *Schlechter* 47 (A, BH, BM, G, K, N, P, T, V, W, Z); Kamiesberg to mouth of the Orange River, *Zeyher* 73 (A, B, G, K, N, S, Z). Calvinia distr.: Between Lospers Plaats and Springbokkuil River, *Zeyher* 1813 (A, B, BH, BM, G, K, N, P, St, Z). Prince Albert distr.: Between Dwyka River and Zwart-bulletje, *Drège* (BM, G, K, N, O, P, S, V). Without precise locality: Prom. bon. Spei, 1862, *Pappe* (BM).

## TYPE SPECIMEN.

*Drège* (lectotype !) is deposited in the Botanisches Museum, Berlin-Dahlem.

## COMMON NAMES.

Bosjes-gras. Twa-gras. T'waagras.

## ECONOMIC NOTES.

*Drège* states that "die Körner dieses Grases werden als Grütze von den Hottentotten sehr geschätzt."

## REMARKS.

*Pearson* 4590 appears to be a large-flowered form of this species. The glumes are fairly large (I = 15 mm., II = 17 mm.) and pubescent towards the margins: the lemma and central awn are longer than in most other specimens seen. In general characters however this gathering agrees well with *A. brevifolia*.

24. *A. uniplumis* *Licht.* in *Roem. et Schult.*, Syst. Veg. 2. 401 (1817); Trin. Gram. Unifl. et Sesquifl. 180 (1824); Trin. in Mem. Acad. Imp. Sc. Petersb. 6. I. 89 (1829); Kunth, Enum. 1. 195 (1833); Trin. et Rupr. Spec. Gram. Stip. 172 (1842); Walp. Ann. Bot. 3. 750 (1852); Steud. Syn. Pl. Glum. 1. 144 (1854); Hack. in Engl. Bot. Jahrb. 11. 400 (1889); Dur. et Schinz, Consp. 5. 809 (1894); Hack. in Bull. Herb. Boiss. 4. Append. III. 19 (1896) pro parte; Stapf in Dyer, Fl. Cap. 7. 569 (1899) pro parte; F. Bolus in Ann. S. Afr. Mus. 9. IV. 234 (1915) pro parte; Dinter in Fedde, Rep. 15. 343 (1918); Garabedian in Ann. S. Afr. Mus. 16. II. 405 (1925) pro parte; Henrard Crit. Rev. 3. 643 (1928); Henrard Monogr. 1. 77 cum ic. tab. 19 (1929); Range in Fedde, Rep. 33. 10 (1933); Obermeijer, Schweickerdt et Verdoorn in Bothalia, 3. II. 227 (1937). *A. uniplumis* *Licht. var. Neesii* Walp. sec. Garabedian in Ann. S. Afr. Mus. 16. II. 406 (1925), non Walp. *Arthratherum uniplume* Nees, Fl. Afr. Austr. 181 (1841).

*Perennial*, densely caespitose. Culms including the inflorescence up to 75 cm. high or more, erect, 3-4-noded, simple or branched upwards; internodes striate and terete,

smooth or scaberulous; nodes glabrous. *Leaf-sheaths* reduced to leafless scales, or the upper tight, terete, striate, smooth or scaberulous upwards, shorter than the internodes; ligule a ciliate rim; auricles densely bearded; collar glabrous; *blades* setaceous, convolute, curved or flexuous, up to 10 cm. long, glabrous and striate on the lower surface, scaberulous on the upper surface with usually a few long hairs towards the ligule. *Panicle* long-exserted, fairly compact to diffuse; axis terete in lower part, angular and scaberulous upwards; branches spreading or suberect, usually solitary but branched near the base, almost smooth; pedicels capillary, often sinuate, scaberulous, much thickened upwards. *Spikelets* pale yellow to purplish or purplish-brown. *Glumes* glabrous or with scattered marginal hairs, almost papery, unequal; the lower 8–9 mm. long; the upper 9–11 mm. long. *Lemma* cylindric, including the callus about 4 mm. long, smooth, slightly tuberculate upwards; *callus* about 1 mm. long, acute, densely bearded; column of awns about 5 mm. long, densely penicillate at the apex, otherwise glabrous; central awn up to 2.5 cm. long, naked in its lower part, densely plumose upwards; lateral awns up to 12 mm. long, very fine.

#### SOUTH WEST AFRICA.

Hoarusib River, west of Klein Otavi, III. 1926, *Barnard* SAM. 33278 (S); Ombombo to Kaoko Otavi, II. 1926, *Barnard* SAM. 33310 (S); Omaheke, IV. 1913, *Dinter* 2883 (B); Andoni, *Barnard* 812 (S) et 817 (S); Otjitambi, *Schlettwein* 42a (B); Grootfontein, *Bail* 7 (B); Otjituo, II. 1906, *Seiner* 21 [671] (B, W); Otjiwarongo, III. 1928, *Bradfield* 268 pro parte (N); Ozondjache, XII. 1938, *Volk* 542 (D); Usakos, IV. 1939, *Volk* 74 (D); Fockshof, IV. 1938, *Volk* A. 158 (D); between Okatambeke and Owinananaua, IV. 1911, *Seiner* 443 (B); Okatambeke, II. 1911, *Seiner* 168 (B); Omaruru, VI. 1916, *Waibel* 122 (B); Ameib, II. 1885, *Belck* 53 (B, Z); Okahandja, XII. 1910, *Dinter* 1638 (B) et 1530 (B) et *Grossarth* 40 (B) et *Bertling* 5 (B); between Windhuk and Karibib, III. 1910, *Mücke* 66 (N); Ababes, XII. 1915, *Pearson* 9174 (K, S) et 9182 (K); between Kubas and Ababes, IV. 1913, *Engler* 6133 (B, K); Otjimbingue, V. 1886, *Marloth* 1330 (A, O); Windhuk, III. 1905, *Trotha* 116 (B) et *Bohr* 14 (B) et I. 1916, *Pearson* 9628 (K, S); Awas Mountains, I. 1916, *Pearson* 9649 (BH, K, S); 100 km. east of Walvisbay, *Wyley* s.n. (V); Rehoboth to Aub, IV. 1911, *Dinter* 2221 (B); between Nauchas and Areb, I. 1916, *Pearson* 9023 (BH, K, S, WR); Areb, III. 1908, *Hartmann* 10c (B); Sendlingsgrab, I. 1908, *Hartmann* 10b et 10d (B); Oas, *Polizeistation* 31 (B); between Gamis and Bull's Mouth Pass, *Pearson* 8940 (K); Gamis, XII. 1915, *Pearson* 8973 (K); Zeskameelboom, *Dinter* 2066 (B); between Voigtsgrund and Breckhorn, XII. 1915, *Pearson* 9350 (BH, K, S); between Voigtsgrund and Ganaams, XII. 1915, *Pearson* 9364 (K) et 9390 (K); Gründoorn, II. 1909, *Pearson* 4555 (A, D, K, N, S, Z); Awasab, *Hartmann* 10a (B); Horas, *Hartmann* 10 (B); Mount Brukkaros, II. 1931, *Sordahl* 15 (B, W) et IV. 1931, *Sordahl* 43 (B, W); Kunyas, V. 1907, *Range* 354 (B); between Ausis and Khuias, *Schenck* s.n. (V); Byzondermaid, I. 1885, *Schinz* 660 (Z); Kunub, IV. 1911, *Range* 1015 (B); between Gellap and Great Fish River, XII. 1915, *Pearson* 9285 (K); Garinai, *Eichler* 35 (B); Lüderitzbucht (Angra Pequena), *Schinz* 662 (Z) et VII. 1903, *Schultze* 46 (B); Kuibis, V. 1909, *Range* 656 (B); Buchholzbrunn, II. 1909, *Pearson* 3655 (BH, K); Sandverhaar, *Pearson* 3704 (N) et 4620 (K) et 4603 (K); Seeheim to Kalkfontein, II. 1909, *Schäfer* 58 (B); Inachab, XI. 1897, *Dinter* 1089 (Z); Wasserfall, I. 1913, *Pearson* 8606 (BH, N); Little Karas Mountains, I. 1916, *Pearson* 9724 (BH, K, S); Sabiesis, II. 1909, *Pearson* 4117 (BH, D, K, N, S); Great Karas Mountains, I. 1913, *Pearson* 8499 (BH, D, G, K, W) et 8500 (BH, K, S) et *Blank* 61 (B); Naossonabis, XI. 1909, *Range* 802 (B); Dabaigabis, I. 1909, *Pearson* 4381 (A, K, N, S); Warmbad, I. 1909, *Pearson* 4027 (K, S, T).

#### BECHUANALAND PROTECTORATE.

Makarikari Lake, IV. 1931, *Pole Evans* 3283 (B, K, N); Artesia, IV. 1931, *Pole Evans* 3167 (K, N) et 3172 (N); Pitsani, IV. 1929, *Pole Evans* 2344 (K, N); Kutje, V. 1928, *Nobbs* 60 (U); Letlaking, V. 1928, *Nobbs* 23 (U); Kaotwe, IV. 1930, *van Son* TM. 28608 (T); between Malopo and Kaotwe, V. 1928, *Nobbs* 74 (U); Kauke, III. 1930, *van Son* TM 28610 (T); between Sekuma and Kooa, I. 1905, *Schultze* 342b (B).

## CAPE PROVINCE.

Gordonia distr.: Uppington, VII. 1925, *Barnard* SAM. 36146 (S); do., VIII. 1923, *Borcherds* H. 21524 (N); near Spitzkop, IV. 1923, *Pole Evans* 2178 (N). Kenhardt distr.: Aughrabies Falls, IV. 1936, *Leipoldt* BH. 21754 (BH). Hay distr.: Eitalersfontein, *Rehmann* 3346 (B, K, Z); Griquatown, anno 1928, *Conradie* 4 (St); near Griquatown, III. 1920, *Pole Evans* 26 (K). Herbert distr.: Witkoplaagte, IV. 1937, *Wilman* 4198 (B, K, N, V, Z). Kimberley distr.: Modderivier, II. 1894, *Kuntze* s.n. (B); Kenilworth, IX. 1901, *Galpin* 6319 (N); Riverton, IV. 1914, *Wilman* 690 (Mc). Barkly West distr.: Barkly West, II. 1921, *Wilman* 2142 (Mc). Kuruman distr.: Kuruman, III. 1928, *Pole Evans* 2062 (N) et 2094 (N, W); do., *Dedman* in Hb. Stell. 10052 (St); without precise locality: *Lichtenstein* 50 (60?), C. b. Sp., (B); L. Bushmanland, *Marloth* 3721 (N).

## ORANGE FREE STATE.

Boshof distr.: Smitskraal, IV. 1911, *Burt Davy* 10123 (N); Kroonstad distr.: Bothaville, I. 1933, *Goossens* 1172 (B, N).

## TRANSVAAL PROVINCE.

Pretoria distr.: Between Elandsrivier and Klippan, *Rehmann* 5113 (B, K). Lydenburg distr.: Near Lydenburg, *Atherstone* s.n. (A, K, S). Waterberg distr.: Warmbaths, II. 1936, *Irvine* 41 (N). Zoutpansberg distr.: Zoutpan, IV. 1934, *Schweickerdt et Verdoorn* 630 (B, N); Messina, *Pole Evans* 1906 (N).

## TYPE SPECIMEN.

*Lichtenstein* 50 (60?) is deposited in the Botanisches Museum, Berlin-Dahlem.

## COMMON NAMES.

Blinkaar. Bushman grass. Buschmanngras. Langbeen Twaa. Large Bushman grass. Silwergras. Soetgras. T'waagras.

## ECONOMIC NOTES.

This species constitutes one of the main fodder-grasses of the Namib where it remains green only for a very short period; it is also eaten in the dried state by stock and game. In the Griqualand West area it is also considered an excellent fodder and as it does not produce stools, it may be cut and stored as hay or silage. In the pre-flowering and flowering stage this grass is sweet, but gradually becomes less so after frost and winter rain. In the wilted condition this species has been found to contain prussic acid.

24a. *A. uniplumis* Licht. var. *Neesii* Trin. et Rupr. Gram. Stip. 173 (1842); Walp. Ann. Bot. 3. 750 (1852); Dur. et Schinz, Consp. 5. 809 (1894); Dinter in Fedde, Rep. 15. 343 (1918); Henrard Crit. Rev. 3. 646 (1928); Henrard Monogr. 1. 77 (1929).

*A. uniplumis* Licht. sec. Stapf in Dyer, Fl. Cap. 7. 569 (1899) pro parte; Stent in Bothalia 1. IV. 278 (1924), non Licht.

The facies of this variety greatly resembles that of the species. The glumes however are longer and the lemma is somewhat larger than in the species. Furthermore the central awn is fairly robust, usually dark in colour and plumose to the base, the column however is glabrous.

## CAPE PROVINCE.

Colesberg distr.: Near Colesberg, *Drège* 901 (B). Kimberley distr.: Rietpan, III. 1917, *Potgieter* TM. 19179 (T); Warrenton, IV. 1917, *Pole Evans* H. 11623 (K); Warrenton, II. 1926, *Smith* 2347a (N). Barkly West distr.: Driefontein, XII. 1936, *Acocks* 1468 (Mc). Hay distr.: Near Postmasburg, VI. 1929, *Uys* G. 3 (N). Vryburg distr.: Vryburg, III. 1920, *Stent* H. 21515 et H. 21449 (N); do., II. 1923, *Rodger* BH. 21801 (BH, Mc); do., II. 1916, *Viljoen* H. 12044 (K); Armoedsvlakte, IV. 1912, *Sharpe* H. 7473 (N); do., III.



1924, *Henrici* 89 (N); do., XII. 1920, *Mogg* in Hb. Stell. 12543 (St). Mafeking distr.: Mafeking, IV. 1929, *Pole Evans* 2426 (K, N) et 2441 (K, N) et IV. 1929, *Pole Evans* 2397 (K, N, W). Kuruman distr.: Witdraai, III. 1917, *Pole Evans* 2096 (N).

#### BECHUANALAND PROTECTORATE.

Nkate, IV. 1931, *Pole Evans* 3297 (K) et 3298 (N) et 3302 (K); Metsematluko, IV. 1928, *Nobbs* 25 (U); Mochudi, I. 1914, *Rogers* 6315 (BH, K, N, T); do., IV. 1914, *Harbor* BH. 21800 (BH).

#### ORANGE FREE STATE.

Bloemfontein distr.: Bloemfontein, *Rehmann* 3722 (B, BM, K, Z); Glen, IV. 1926, *School of Agriculture* NH. 3446 (N). Hoopstad distr.: Wesselsbron, I. 1933, *Goossens* 1248 (B, N); Hoopstad, III. 1909, *Potts* 1149 (GU). Kroonstad distr.: Bothaville, IV. 1931, *Boshoff* 2 (N). Boshoff distr.: Bethel-Pella, IV. 1931, *Wolff* 12 (N). Between Kimberley and Bloemfontein, *Buchanan* 291 (K, S).

#### TRANSVAAL PROVINCE.

Bloemhof distr.: Christiana, III. 1912, *Burt Davy* 12975 (N); Smitskraal, IV. 1911, *Burt Davy* 10123 pro parte (N); Schweizer Reneke, II. 1904, *Burt Davy* 1627 (N). Wolmaransstad distr.: Wolmaransstad, IV. 1931, *Liebenberg* 2437 (N, W); Maquassi, II. 1918, *Rogers* 20654 (G, Z). Zoutpansberg distr.: Messina, X. 1929, *Turner* 23 (N); do., II. 1919, *Rogers* 22545 (T, Z).

#### TYPE SPECIMEN.

*Drège* from Colesberg deposited in the Botanisches Museum, Berlin-Dahlem? Perhaps there is a specimen in the Trinius Herbarium, Leningrad which should be regarded as the type. I have not seen this sheet.

24b. *A. uniplumis* Licht. var. *Pearsonii* Henr. Crit. Rev. **3**. 647 (1928); Henrard Monogr. **1**. 77 (1929).

*A. Dregeana* Trin. et Rupr. sec. Dinter in Fedde, Rep. **15**. 341 (1918) pro parte, non Trin. et Rupr. *A. uniplumis* Licht. sec. Hack. in Bull. Herb. Boiss. **4**. Append. III. 19 (1896); Stapf in Dyer, Fl. Cap. **7**. 569 (1899); Garabedian in Ann. S. Afr. Mus. **16**. II. 405 (1925) omnes pro parte, non Licht.

This variety greatly resembles the species but may be recognised by the column of the awns which is plumose in its upper part (at times so almost from the base). The central awn is not as rigid and bristlelike as in the var. *Neesii*, furthermore the latter has larger glumes.

#### ANGOLA.

Between Gambos and Cabama, V. 1909, *Pearson* 2487 (K).

#### SOUTH WEST AFRICA.

Ondongo, *Barnard* SAM. 32241 (S); Grootfontein, II. 1933, *Schoenfelder* 98 (K, N); Omatope, II. 1886, *Schinz* 659 (V, Z); Blockfontein, V. 1939, *Volk* 1694 (D); Otjiwarongo, XII. 1938, *Volk* 394 (D); Otjiputo, II. 1939, *Volk* 1230 (D); Otjimbingue, *Marloth* 1330 (B, V); Gobabis, II. 1906, *Kupper* 60 (B); without precise locality, *Wembley Exhibition* 29 (B, BH, S).

#### BECHUANALAND PROTECTORATE.

Makarikari Lake, IV. 1931, *Pole Evans* 3287 (K, N). Mochudi, I. 1914, *Rogers* 6596 (A, K, T, Z).

#### CAPE PROVINCE.

Kimberley distr.: Kimberley, *Rehmann* 3470 (K, Z).



## ORANGE FREE STATE.

Without precise locality, *Buchanan* 69 (D, K, S).

## TYPE SPECIMEN.

*Pearson* 2487 is deposited in The Herbarium, Royal Botanic Gardens, Kew.

25. **A. gonatostachys** *Pilger* in Engl. Bot. Jahrb. **48**. 343 (1912); *Dinter* in Fedde, Rep. **15**. 341 (1918); *Garabedian* in Ann. S. Afr. Mus. **16**. II. 402 (1925); *Henrard Crit. Rev.* **1**. 205 (1926); *Henrard Monogr.* **1**. 81 cum ic. tab. 20 (1929); *Range* in Fedde, Rep. **33**. 8 (1933); *Theron* in Fedde, Rep. **40**. 30 (1936) [*sphalm. gonostachys*].

*Perennial*, densely caespitose, tufts 2-3.5 cm. high. *Culms* up to 10 cm. long, exserted beyond the small tussocks, somewhat geniculate, 1-noded; lower internode exserted, 5-6 cm. long, slender, terete, thickened upwards towards the node; upper node hairy. Lower *leaf-sheaths* reduced to yellowish broad scales, sulcate-striate, glabrous or scantily woolly along the margins, the upper sheath partly embracing the inflorescence, scaberulous and leafless; *ligule* a ciliate rim; auricles densely long-bearded; blades up to 2 cm. long, involute, obtuse, striate and sulcate, scaberulous on the lower surface, with fairly long hairs arising dorsally between the longitudinal ridges, upper surface hirtellous, curved, glaucous. Peduncle very short. *Panicle* almost sessile, sheathed by the uppermost sheath, 3-4 cm. long, spike-like; axis striate and pubescent; lower branches binate, the upper solitary. Pedicels clavate and hairy near the apex. *Spikelets* pallid, somewhat secund. *Glumes* subequal, 7-9 mm. long, lanceolate, acuminate, the lower distinctly scaberulous. *Lemma* including the callus about 4 mm. long; *callus* 1 mm. or somewhat longer, acute, shortly bearded, but long-bearded at the base of the lemma; column of awns up to 4 mm. long; central awn about 1 cm. long, glabrous at the base, densely plumose in its upper part up to the tip; lateral awns about 7 mm. long.

## SOUTH WEST AFRICA.

*Rotekuppe*, I. 1907, *Range* 188 (B); do., I. 1910, *Dinter* 1022 (B); *Guos*, Küstenwüste, IX. 1911, *Range* 1177 (B, N).

## TYPE SPECIMEN.

The Syn-types are deposited in the Botanisches Museum, Berlin-Dahlem.

## COMMON NAME.

Kleines Buschmanngras.

26. **A. lanipes** *Mez* in Fedde, Rep. **17**. 153 (1921); *Garabedian* in Ann. S. Afr. Mus. **16**. II. 403 (1925); *Henrard Crit. Rev.* **2**. 285 (1927); *Henrard Monogr.* **1**. 81 (1929); *Theron* in Fedde, Rep. **40**. 30 (1936).

*Perennial*, densely caespitose, dwarf, including inflorescence up to 10 cm. high. Lower *leaf-sheaths* pallid, striate, dorsally glabrous but densely woolly lanate towards and on the margins with white hairs, margins of leaf-sheaths upwards hyaline, upper leaf-sheaths densely woolly all over the dorsal surface, only the stout midrib clearly visible; *ligule* a fringe of woolly hairs; blades about 0.5-1.0 cm. long, somewhat recurved, linear, obtuse, glabrous and striate, glaucous, apparently terete but the margins conduplicate and somewhat involute. Culm 1-noded (the lowermost node sheathed but not exserted.) Axis terete, glabrous somewhat thickened towards the node. *Sheath* arising at the upper node in the axil of which the inflorescence appears to arise, narrowly lanceolate, glaucous, glabrous, striate, with a much-reduced blade. *Inflorescence*  $\pm$  4-flowered, a lax sub-simple panicle, with the branchlets at the base of the inflorescence bearing 1-2 spikelets. Rhachis sub-compressed, striate, flexuous, minutely scaberulous. Pedicels likewise, somewhat thickened towards the apex. *Glumes* subequal, three-nerved; the lower slightly shorter than the upper, about 9-9.5 mm. long, with minutely scaberulous lines on the outer surface not

unlike those found in *A. obtusa* Del.; the upper smooth and glabrous, margins hyaline. *Lemma*  $\pm$  6 mm. long including the callus; *callus* acute, densely hairy, about 2 mm. long; column of awn 2.0 mm. long, twisted, glabrous. Central awn plumose towards the apex, naked and glabrous below and at the point of insertion of the lateral filiform glabrous 9 mm. long awns. *Anthers* 3 mm. long.

#### SOUTH WEST AFRICA.

Near Lüderitzbucht, west of Kuibis, *Range* 1822 (B).

#### TYPE SPECIMEN.

*Range* 1822 (unicum?) is deposited in the Botanisches Museum, Berlin-Dahlem.

This species is very closely related to *A. gonatostachys* Pilger and differs from it in several minor points. The facies of the two species concerned is very similar. A wider range of material of these two species may prove them to be conspecific.

27. *A. Dregeana* (Nees) Trin. et Rupr. Spec. Gram. Stip. 169 (1842); Walp. Ann. Bot. 3. 749 (1852); Steud. Syn. Pl. Glum. 1. 144 (1854); Dur. et Schinz, Consp. 5. 802 (1894); Stapf in Dyer, Fl. Cap. 7. 569 (1899) excl. syn. pro parte; Dinter in Fedde, Rep. 15. 341 (1918); Garabedian in Ann. S. Afr. Mus. 16. II. 401 (1925) pro parte; Henrard Crit. Rev. 1. 154 (1926); Henrard Monogr. 1. 83 cum ic. tab. 22 (1929); *Range* in Fedde, Rep. 33. 8 (1933); Theron in Fedde, Rep. 40. 20 (1936).

*A. obtusa* Del. sec. Hack. in Bull. Herb. Boiss. 4. Append. III. 19 (1896) non Del.; Garabedian in Ann. S. Afr. Mus. 16. II. 403 (1925) pro parte, non Del. *Stipagrostis Dregeana* Nees, Fl. Afr. Austr. 172 (1841); Presl, Bot. Bemerck. 121 (1844).

*Perennial*, densely caespitose, much-branched at the base. *Culms* slender, erect or geniculately ascending, simple, 1-3-noded, the lowermost node basal or almost so, up to 25 cm. high including the awns; internodes terete or somewhat compressed, smooth and glabrous, usually exserted; nodes glabrous. *Leaf-sheaths* very tight, distinctly striate, slightly scaberulous, shorter than the internodes; the lower broad, pallid, firm and persistent, much-reduced and scale-like, bearing very short blades; *ligule* a short ciliolate rim; auricles pubescent; collar glabrous; blades setaceous, convolute, subacute, up to 12.5 cm. long, fairly rigid, glabrous and smooth beneath, more or less hirtellous or pubescent on the upper surface. *Panicle* erect, or somewhat nodding at the summit, lax and loose, up to 12 cm. long including the awns; rhachis smooth, grooved; branches usually binate, smooth; branchlets 1-2-flowered; the branches, branchlets and pedicels rather capillary and often flexuous. *Spikelets* yellowish and purple. *Glumes* linear-lanceolate, subacuminate, subequal, 3-nerved; the lower 11-13 mm. long, acuminate, purple towards the base, minutely scaberulous on the keel towards the apex, towards the apex often a few scattered minute hairs, in the young state dorsally often somewhat shortly hairy, hairs deciduous; the upper 11-13 mm. long, obtuse, emarginate or distinctly bifid, mucronate from the sinus, minutely scaberulous towards the apex, otherwise glabrous, purple towards the base. *Lemma* oblong-cylindric, glabrous, purplish, including the callus about 4 mm. long; *callus* acute, densely hairy, 1-1.5 mm. long; column of awns about 4 mm. long, twisted, glabrous; central awn 3-4 cm. long, feathery above the middle to the very tip, plumose region obtuse in outline; lateral awns naked or very nearly so, up to 17 mm. long. *Anthers* 5.5-6 mm. long.

#### SOUTH WEST AFRICA.

North of Lüderitzbucht, X. 1906, *Range* 8 (B); Lüderitzbucht (Angra Pequena), Hermann 49 (B); do., 1907, *Range* 491 (B); do., IV. 1909, Marloth 4664 (K, N); do., Galpin et Pearson 7395 (K); do., VII. 1925, Moss 11518 (K); do., Peyer 4 (Z); Pomona, V. 1929, Dinter 6344 (B, D, G, K, St); do., VI. 1929, Dinter BH. 21797 (BH); Klinghardtgebirge, VIII. 1913, Schäfer 512 (B); Buchuberge, VIII. 1929, Dinter 6602 (B, BH, K, St); Hereroland, 1887, Nels 72 (Z).

## CAPE PROVINCE.

Little Namaqualand distr.: Near mouth of Orange River, X. 1830, *Drège* (2543) (B, BM, G, K, N, O, P, V); Groot Derm, X. 1926, *Pillans* 5615 (BH, K, N); Witbank, X. 1926, *Pillans* 5217 (BH, N).

## TYPE SPECIMEN.

*Drège* 2543 is deposited in the Botanisches Museum, Berlin-Dahlem.

28. **A. garubensis** *Pilger* in Engl. Bot. Jahrb. **48**. 344 (1912); *Dinter* in *Fedde*, Rep. **15**. 341 (1918); *Garabedian* in Ann. S. Afr. Mus. **16**. II. 402 (1925); *Henrard* Crit. Rev. **1**. 192 (1926); *Henrard* Monogr. **1**. 80 cum ic. tab. 21 (1929); *Range* in *Fedde*, Rep. **33**. 8 (1933); *Theron* in *Fedde*, Rep. **40**. 8 (1936).

*A. dregeana* Trin. et Rupr. sec. F. Bolus in Ann. S. Afr. Mus. **9**. IV. 234 (1915) pro parte, non Trin. et Rupr.

*Perennial*, laxly caespitose, from a much-branched almost woody rootstock. Innovations erect or irregularly ascending, intra- or extravaginal. Culms erect or somewhat ascending, rather thin and elegant if compared with the robustly-branched rootsystem, terete, smooth, 2-3-noded; internodes terete, glabrous, exserted; nodes glabrous. Lower leaf-sheaths reduced to pale striate glabrous scales, bearing much-reduced leaf-blades; the upper tight, shorter than the internodes, glabrous and terete below, striate upwards; ligule a minute ciliate rim; auricles minutely pubescent or glabrous; collar glabrous; blades very narrow, linear, convolute, setaceous, acute and subpungent, rather rigid and curved (almost wiry), up to 12 cm. long, glabrous and striate beneath, hirtellous on the upper surface, glaucous, gradually tapering to a point. Panicle shortly exserted, up to 20 cm. long including the awns, somewhat depauperate, very lax and open; rhachis terete and smooth below, rather angular and scaberulous upwards; axils glabrous; lower branches solitary or 2-3-nate from the base, the upper solitary, all few-flowered and scaberulous; pedicels minutely scaberulous, subclavate, as long as or shorter than the glumes. Spikelets erect, pallid but purplish towards their base. Glumes lanceolate, glabrous; the lower up to 12 mm. long, shortly bidentate at the subobtusate apex; the upper subacute, 12.5-15 mm. long. Lemma smooth, including the callus about 5.5 mm. long; callus 1.5 mm. long, hairy, acute; column of awns 8-10 mm. long, twisted; central awn up to 40 mm. long, naked in the lower third or plumose almost to the base, plumose to the very tip, slender and acute in outline; lateral awns naked, very thin, up to 15 mm. long.

## SOUTH WEST AFRICA.

Kunguibgebirge, X. 1912, *Range* 1069 (B); 18 km. west of Aus, II. 1909, *Pearson* 4213 (BH, K); *Garub*, X. 1907, *Range* 508 (B, BM, K, N); do., X. 1907, *Range* 536 (B).

## TYPE SPECIMEN.

*Range* 508 and 536 are deposited in the Botanisches Museum, Berlin-Dahlem.

29. **A. sericans** *Hack. apud Schinz* in Bull. Herb. Boiss. **3**. 381 (1895); *Stapf* in *Dyer*, Fl. Cap. **7**. 563 (1899); *Henrard* Crit. Rev. **3**. 554 (1928); *Henrard* Monogr. **2**. 158 cum ic. tab. 61 (1932); *Theron* in *Fedde*, Rep. **40**. 17 (1936).

*Perennial*, densely caespitose. Culms simple, erect, terete, up to 75 cm. high, very slender, 1-noded. Leaf-sheaths very tight, striate, glabrous or hairy all over except in the region just above the nodes, shorter than or exceeding the internodes; ligule ciliate; auricles bearded; blades finely filiform, setaceous, strictly erect, convolute, acute, up to 30 cm. long or even almost as long as the culms, glaucous, glabrous or hairy below, glabrous or hispidulous above, 0.5-1.0 mm. wide, strongly nerved. Panicle erect, dense, up to 20 cm. long, the base of the panicle sheathed by a submembranous thinly villous light-brown bract, the upper branches sparingly branched; branchlets and pedicels hairy or glabrous, the latter much shorter than the glumes. Glumes subequal, villous, linear-lanceolate,



acuminate, 3-nerved, with sparingly hairy or hyaline tips; the lower 10–15 mm. long; the upper 12–16.5 mm. long. *Lemma* purple, smooth, slightly scaberulous towards the apex, linear-lanceolate, including the callus up to 7 mm. long, produced without an articulation into the column; *callus* about 1–1.5 mm. long, acute, densely hairy; column 2–3.5 mm. long, twisted, hairy; central awn divergent or spreading, up to 24 mm. long, densely but shortly plumose except for the scabrid apex; lateral awns resembling the central, but only up to 18 mm. long. *Pale* 2.5 mm. long, obtuse, nerveless. *Anthers* about 5 mm. long. *Stigmas* pale yellow, up to 2.5 mm. long. *Caryopsis* linear, 4 mm. long, 0.3 mm. wide, pale brown.

#### TRANSVAAL PROVINCE.

Standerton distr.: Standerton, *Rehmann* 6793 (B, BH, BM, K, V, Z). Vereeniging distr.: Leeuwkuil Pasture Research Station, III. 1937, *Bunting* 137 (K, N, WR); do., IX. 1937, *R. Story* in NH. 24574 (B, BM, K, N, V, W, Z); do., III. 1939, *R. Foster* in NH. 24575 (B, BM, K, N, V, W, Z).

#### TYPE SPECIMEN.

*Rehmann* 6793 is deposited in the Naturhistorisches Museum, Vienna.

#### REMARKS.

A very rare species apparently with a limited geographic distribution. Until the very welcome recent rediscovery of this plant by Mr. R. Story (*Bunting* 137) the author of the present paper believed this plant to have been of hybrid origin. *Rehmann* 4046 from Pretoria cited by Stapf in Dyer, Fl. Cap. 7. 563 (1899) under this species very probably does not belong here. I do not remember seeing this number and possibly the locality indicated on the sheet is incorrect, as *A. sericans* is so far only known to occur in the true Highveld area of the Transvaal.

The species bears a strong resemblance to *A. capensis* Thunb. var. *Dieterleniana* mihi with which it may readily be confused. Dissection of the spikelets however immediately reveals that the species in question belong to different sections of the genus.

30. *A. Sciurus* Stapf in Dyer, Fl. Cap. 7. 557 (1899); Stent in Bothalia 1. IV. 277 (1924); Henrard Crit. Rev. 3. 548 (1928); Henrard Monogr. 2. 164 cum ic. tab. 65 (1932).

Robust erect *perennial*, up to 140 cm. high. *Culms* arising from a short rhizome, about 4–5-noded, simple; internodes included or exserted, up to 25 cm. long but often much shorter, almost glabrous to densely adpressedly woolly just below the nodes, terete, smooth or somewhat striate towards the nodes; nodes glabrous, not very conspicuous. *Leaf-sheaths* crowded near the base, striate, glabrous or more or less fugaciously woolly, tight; *ligule* a line of very short hairs obscured by the dense aggregation of wool at the mouth of the leaf-sheath, more rarely the mouth of older leaf-sheaths almost glabrous; *blades* linear, acute, setaceously convolute, up to 60 cm. long or even longer, smooth on the lower surface, markedly striate and finely asperulous on the upper surface, about 5 mm. wide or less at the base. *Panicle* dense, contracted, at times almost spike-like, up to 45 cm. long but often shorter, erect; rhachis stout, smooth; branches fascicled, the lowest up to 20 cm. long, remotely and repeatedly branched; branchlets filiform to capillary, scaberulous. *Spikelets* pallid or tinged with purple, glabrous. *Glumes* 1-nerved, very unequal, fairly thin; the lower lanceolate oblong, acute, 5–7 mm. long, minutely scaberulous towards the apex; keel prominent and minutely scabrous; the upper linear-oblong, 11–13 mm. long, shortly mucronate from a bifid apex. *Lemma* linear, up to 12 mm. long, smooth, obscurely beaked; *callus* 1–1.5 mm. long, rounded and obtuse, densely hairy; awns subequal, the central up to 23 mm. long, the lateral up to 20 mm. long. *Pale* 1.5 mm. long. Lodicules few-nerved, about 1.5 mm. long. *Anthers* 6 mm. long, anther-cells minutely apiculate.



## NATAL PROVINCE.

Estcourt distr.: Colenso, III. 1894, *Kuntze* s.n. (K, N); without precise locality, *Gerrard* 471 (BM, K, N) and *Gerrard et McKen* 161 (D, N).

## TRANSVAAL PROVINCE.

Carolina distr.: Waterval Boven, II. 1904, *Burt Davy* 1449 (N); Badplaats, II. 1926, *Pole Evans* 1967 (N); between Machadodorp and Carolina, II. 1908, *Mundy* H. 4292a (N). Lydenburg distr.: Machadodorp, III. 1934, *Pole Evans* 3688 (N). Waterberg distr.: Zebediela's Kraal, *Nelson* 26 (K, N).

## TYPE SPECIMEN.

*Nelson* 26 is deposited in The Herbarium, Royal Botanic Gardens, Kew.

## REMARKS.

The amount of wool (pubescence) on the internodes is variable. Some specimens (*Burt Davy* 1449) have almost glabrous internodes. The elongated obtuse callus and the absence of an articulation in the lemma however, provide a good means of distinguishing the species.

31. **A. bipartita** (Nees) Trin. et Rupr. Spec. Gram. Stip. 144 (1842); Walp. Ann. Bot. 3. 745 (1852); Steud. Syn. Pl. Glum. 1. 140 (1854); Dur. et Schinz, Consp. 5. 801 (1894); Medley-Wood, Natal Plants 5. IV. tab. 483 cum descr. (1908); Phillips in Ann. S. Afr. Mus. 16. 347 (1917); Stent in Bothalia 1. IV. 277 (1924); Henrard Crit. Rev. 1. 54 (1926); Henrard Monogr. 2. 194 cum ic. tab. 89 (1932).

*A. aequiglumis* Hack. sec. Medley-Wood, Natal Plants 2. tab. 197 cum descr. (1904), non Hack. *Chaetaria bipartita* Nees, Fl. Afr. Austr. 187 (1841).

*Perennial*, densely caespitose, with a short erect or oblique rhizome. *Culms* erect or ascending, including the inflorescence up to 65 cm. high, but usually much smaller, simple, terete or compressed below, glabrous or puberulous, few-noded; internodes exserted, striate; nodes glabrous. *Leaf-sheaths* shorter than the internodes, compressed, firm, striate, persistent, glabrous or minutely puberulous between the nerves, the upper lax and smooth. *Ligule* a densely ciliate rim; auricles long-bearded; collar more or less scaberulous; *blades* narrow, linear, acute, up to 20 cm. long, usually very much shorter, up to 2 mm. wide when expanded, glaucous, rigid, curved and folded, smooth or scaberulous on the lower surface, scabrous on the upper surface, strongly nerved, margin minutely scabrous. *Panicle* effuse, up to 30 cm. long (though usually much smaller), and about as broad, very lax; rachis straight or somewhat flexuous, angular, striate, very scabrous upwards; branches spreading, solitary and distant, often branched again into 2 to several branches just above the base, axils pubescent only, naked over a long distance, scanty and remotely branched upwards; branchlets filiform and straight, scabrous, with 1-3 spikelets at the tips; pedicels long, adpressed, the lateral ones usually very much shorter than the glumes, scabrous. *Spikelets* pallid to purplish in colour. *Glumes* unequal, the lower exceeding the upper in length, 1-nerved, linear-lanceolate, mucronate or shortly awned; the lower smooth with a somewhat scabrous keel upwards, up to 11 mm. long; the upper smooth, at times slightly emarginate, up to 9 mm. long. *Lemma* tubulous, not beaked, usually somewhat shorter than the glumes, about up to 8 mm. long, smooth and punctulate above only; *callus* shortly bearded; awns subequal or the central slightly longer, scabrous, 7-13 mm. long, divergent.

## CAPE PROVINCE.

Somerset East distr.: Somerset East, *Bowker* 166 (K). Fort Beaufort distr.: Komagha rivier, *Drège* 3878 (B, BM, G, K, N, O, P, S, V). Kingwilliamstown distr.: Kingwilliamstown, XII. 1894, *Schlechter* 6126 (A, B, BM, G, K, N, V, Z); do., *Sim* 31 (Z). East London distr.: East London, III. 1933, *Langenegger* s.n. (N). Komgha distr.: Komgha, *Flanagan* 1775 (A, BH, N). Queenstown distr.: Queenstown, *Everett* 58 (N); do., II. 1899, *Galpin* 2578 (A, K, N).

## NATAL PROVINCE.

Pietermaritzburg distr.: Near Pietermaritzburg, XII. 1898, *Medley Wood* 7232 (K). Inanda distr.: Verulam, VII. 1893, *Schlechter* (A, B, BH, BM, G, K, N, V, Z). Estcourt distr.: Winterton, I. 1933, *King* 385 (N). Klip River, *Rehmann* 7102 (BM, K, N, V, Z). Without precise locality: XII. 1898, *Medley Wood* 7358 (D, K). Zululand, Mtunzini distr.: V. 1919, *Mogg* H. 20043 (N, W) and XI. 1919, *Mogg* 5921 (N).

## BASUTOLAND.

Mohale's Hoek distr.: Maphutseng, I. 1916, *Dieterlen* 1208 (N, K, P, S). Leribe distr.: Leribe, II. 1877, *Buchanan* 125 (K).

## ORANGE FREE STATE.

Bloemfontein distr.: Bloemfontein, *Rehmann* 3736 (B, BM, K, V, Z); Senekal distr.: Doornkop, XII. 1931, *Goossens* 930 (B, K, N, W). Bethlehem distr.: Bethlehem, I. 1932, *Goossens* 1123 (N). Kroonstad distr.: Kroonstad, *Pont* 100 (Z); do., II. 1928, *Pont* 5 (N); do., *Chennells* 86 (BH). Heilbron distr.: Maccauvlei, X. 1924, *Brandmuller* 108 (N). Without precise locality: *Buchanan* 63 (BH); *Burke* 430 (K, S, Z); *Burke and Zeyher* 1810 (O, V); *Zeyher* 1810 (BM, K, N).

## TRANSVAAL PROVINCE.

Vereeniging distr.: Vereeniging, XII. 1935, *Story* 11 (N). Heidelberg distr.: Uitgevalen, XII. 1909, *Burt Davy* 9125 (N). Wakkerstroom distr.: Amersfoort, III. 1917, *Burt Davy* 17349 (K, N). Johannesburg distr.: Johannesburg, *English* 21788 (BH). Pretoria distr.: Pretoria, II. 1924, *Dickson* 17 (N); do., IV. 1933, *Smith* 6553 (N); do. *Appleton* 91 (K); do., II. 1936, *Mogg* 13727 (N); do., XII. 1933, *Barrie* in Hb. Stell 19669 (St). Lydenburg distr.: Waterval Boven, IV. 1904, *Burt Davy* 1443 b (N). Middelburg distr.: Klein Olifants Rivier, XI. 1893, *Schlechter* 3820 (A, B, BM, D, G, K, N, T, V, Z). Potchefstroom distr.: Klerksdorp, III. 1932, *Moses* 9 (N).

## TYPE SPECIMEN.

*Drège* 3878 is deposited in the Botanisches Museum, Berlin-Dahlem.

## COMMON NAMES.

Krulgras. Steekgras.

## ECONOMIC NOTES.

This species is readily eaten by stock.

32. **A. scabrivalvis** Hack. in Bull. Herb. Boiss. Ser. 2. **6**. 708 (1906); Dinter in Fedde, Rep. **15**. 343 (1918); Stent in Bothalia **1**. IV. 277 (1924); Henrard Crit. Rev. **3**. 534 (1928); Henrard Monogr. **2**. 202 cum ic. tab. 91 (1932).

*Annual*, slender, erect or somewhat ascending, including the inflorescence up to 85 cm. high, often very much smaller, usually branched from or very near the base. *Culms* elegant, slender, branched from nearly all nodes, about 3-4-noded; nodes usually conspicuous, glabrous; internodes glabrous, up to 12 cm. long, exserted, more or less terete. *Leaf-sheaths* lax, the lower slipping from the culms, keeled, striate, minutely scaberulous or glabrous; *ligules* densely and shortly ciliolate; auricles densely ciliolate or glabrous; collar glabrous; *blades* linear, gradually narrowed, up to 30 cm. long and 3.5 mm. wide, often much shorter and narrower, rigid or somewhat flaccid, glabrous beneath, scaberulous and hirtellous on the upper surface, margins scabrous and thickened. *Panicles* terminal and lateral, lax and open, up to 30 cm. or more long, often very much shorter and smaller, ovate in outline. Axis smooth or very minutely scaberulous; branches filiform, straight or somewhat flexuous, scaberulous, solitary or binate, elongate, the lower sometimes more than half as long as the panicle, naked in their lower part, the spikelets more or less scattered or at times congested towards the ends of the branches; pedicels scaberulous, longer to

shorter than the glumes. *Spikelets* usually purple or purplish-brown in colour. *Glumes* linear-lanceolate, acute, prominently awned, slightly unequal to unequal, scaberulous, with a very markedly scabrous keel; the lower up to 9 mm. long, including the awn but often much shorter, awn 2.5 mm. long arising from the slightly bifid apex of the glume; the upper also up to 9 mm. long including the 1.5 mm. long awn, lateral setae well-developed. *Lemma* linear, tubular or somewhat compressed and keeled, about 7–8 mm. long, often much shorter, usually aculeolate-scabrous except near the base but always markedly scabrous on the keel, purplish to greenish in colour and usually mottled, somewhat narrowed towards the apex; *callus*  $\pm$  0.5 mm., rounded, densely bearded; awns up to 14 mm. long, scabrous, erect or spreading, the lateral slightly shorter than the central.

#### SOUTH WEST AFRICA.

Otavi, II. 1925, *Dinter* 5752 (BH, G, GU, N, S, Z); Otjenga, III. 1939, *Volk* 1396b (D); Ossa, III. 1939, *Volk* 1538 (D) et 1539 (D); Otjiputo, II. 1939, *Volk* 1239 (D).

#### CAPE PROVINCE.

Barkly West distr.: Newlands, III. 1934, *Paton* 3158 (K, Mc); Shalen, II. 1937, *Acock* 1859 (Mc); near Spitzkop, II. 1937, *Acock* 1809 (K, Mc).

#### TRANSVAAL PROVINCE.

Potchefstroom distr.: Oudeplaats, IV. 1937, *Bunting* 157 (N). Vereeniging distr.: Vereeniging, I. 1915, *Burt Davy* 15175 (BH) et III. 1917, *Burt Davy* 17214 (N). Boksburg distr.: Vogelfontein, V. 1918, *Rogers* 22675 (Z). Johannesburg distr.: Frankenwald, I. 1933, *Frankenwald Herb.* 229 (WR). Pretoria distr.: Pretoria, II. 1924, *Dickson* 15 (N); do., III. 1925, *McClean* 11 (N); do., III. 1914, *Mogg* 10432 (N); do., I. 1926, *Smith* 2264 (N); do., VI. 1912, *Theiler* 12015 (T); do., IV. 1932, *Smith* 6198 (K); do., II. 1939, *Schweickardt* 1325 (B, K, N, W); Pienaars River, I. 1894, *Schlechter* 4217 (A, BM, G, K, N, P, T, V, Z); do., I. 1926, *Smith* 2170a (N); Saltpan, II. 1937, *Bunting* 76 (N) et 80 (N); do., III. 1937, *Bunting* 117 (N). Waterberg distr.: Warmbaths, I. 1936, *Irvine* 20 (N); Naboomspruit, I. 1919, *Galpin* 427 (N, W) et III. 1923, *Galpin* 566 (N); Potgietersrust, II. 1921, *Galpin* 8891 (K, N, W); Makapan's Poort, III. 1894, *Schlechter* 4689 (A, BH, BM, G, K, N, T, V, W, Z); Crecy, *Carver* 12 (N). Pietersburg distr.: Sand Rivier, III. 1895, *Schlechter* 6909 (A, BH, G, K, N, V, Z); Tzaneen, *Sampson* H. 4429 (N). Zoutpansberg distr.: Mara, II. 1935, *de Klerk* 10 (N).

#### BECHUANALAND PROTECTORATE.

Francistown, IV. 1929, *Gordon* 55 (N); Mahalapye, IV. 1931, *Pole Evans* 3205 (K, N).

#### TYPE SPECIMEN.

The Syn-types *Schlechter* 4217 et 4689 are deposited in the Botanisches Museum, Zürich.

33. *A. effusa* *Henrard* Crit. Rev. 1. 155 (1926); *Henrard Monogr.* 2. 204 cum ic. tab. 92 (1932).

*A. Waibeliana* *Henrard* Crit. Rev. 3. 679 (1928); *Henrard Monogr.* 2. 204 cum ic. tab. 92 (1932).

*Annual*, slender, erect, including the inflorescence up to 90 cm. high (2–3 ft. fide Barnard!). *Culms* elegant, branched from nearly all nodes, about 3–4-noded; nodes conspicuous, glabrous, somewhat swollen; internodes glabrous, up to 15 cm. long, exerted, more or less terete. *Leaf-sheaths* lax, the lower slipping from the stems, keeled, striate, minutely scaberulous; *ligules* densely and shortly ciliate; auricles glabrous to densely ciliate; collar smooth; *blades* linear, gradually narrowed, up to 30 cm. long and up to 3 mm. wide, glabrous or minutely scaberulous on the lower surface, more or less scaberulous and hirtellous on the upper surface, striate, margins thickened. *Panicles* terminal and lateral, very diffuse and open; the terminal 20–30 cm. long or shorter, about 15 cm. wide;



the lateral panicles usually much shorter; axis glabrous; branches solitary or binate, elongate, subcapillary, scaberulous, straight or flexuous, naked in their lower part. *Spikelets* more or less congested towards the end of the branches; pedicels long or somewhat short, scaberulous. *Glumes* about equal or slightly unequal; lower glume lanceolate, purplish, about up to 8.5 mm. long, acute or with an inconspicuous mucro, glabrous in the lower part, scaberulous towards the apex, keel very scabrous especially upwards, 1-nerved; the upper about up to 8 mm. long, purplish or not so, linear lanceolate, of a thinner and more papery texture than the lower glume, truncate or very obtuse at the apex, glabrous, 1-nerved, keel glabrous and smooth. *Lemma* narrowly linear, up to 11.5 mm. long but often very much shorter, tubulous or compressed, hardly narrowed above, pallid or brown, at times mottled, extremely scabrous on the keel upwards and more or less so over the surface in the upper two-thirds; apex of *callus* rounded, obtuse, conspicuous; awns erect straight, or somewhat spreading, scabrous; the central awn about 16 mm. long, the lateral shorter and up to 13 mm. long.

#### SOUTHERN ANGOLA.

Between Gambos Fort and Mission Station, V. 1909, *Pearson* 2445 (K, N).

#### SOUTH WEST AFRICA.

Kunene River Banks, *Barnard* 41 (N, S); Grootfontein, II. 1933, *Schoenfelder* 99 (K, N); Otjiwarongo, III. 1928, *Bradfield* 378 (N); Waterberg, V. 1928, *Bradfield* 378 (A, N); Oweipütz, V. 1886, *Marloth* 1379 (N, W); Karibib, IV. 1913, *Engler* 6162 (B); Tsumebpad, IV. 1939, *Volk* 1672 (D); Ozondjache, XII. 1938, *Volk* 538 (D); Asis, III. 1939, *Volk* 770 (D).

#### TYPE SPECIMEN.

*Engler* 6162 is deposited in the Botanisches Museum, Berlin-Dahlem.

34. *A. canescens* *Henrard* Crit. Rev. Supplem. 708 (1933); *Henrard* Monogr. 2. 210 et 309 et cum ic. tab. 95 (1932).

*A. junciformis* Trin. et Rupr. sec. Stent in *Bothalia* 1. IV. 277 (1924) pro parte, non Trin. et Rupr.

*Perennial*, densely caespitose, with several innovations. *Culms* erect, elegant, simple (very rarely branched), up to 1 m. high, about 4-noded; internodes terete, striate, glabrous or slightly scaberulous below the nodes, exserted; nodes glabrous. *Leaf-sheaths* shorter than the internodes, tight, striate, glabrous or scaberulous, the lower somewhat compressed; *ligule* a ciliate rim; auricles pubescent, at times bearded with long hairs; collar minutely pubescent; *blades* narrow, linear, coarse, 20 cm. long or much longer, involute, flat only near the base, in robust specimens up to 2-2.5 mm. wide, glabrous or scaberulous on the lower surface, scaberulous on the upper surface, margins thickened and scabrid. *Panicle* erect, lax or contracted but often interrupted and then the spikelets congested, up to 20 cm. long; rachis striate, angular, scabrous; branches somewhat remote, binate or ternate, or solitary upwards, naked at the base over some distance or in some cases shortly peduncled and spikelets densely congested; pedicels short, scaberulous. *Spikelets* erect, pallid or yellowish-green, or tinged with purple. *Glumes* unequal, 1-nerved; the lower 5.5-8 mm. long, laterally compressed, keeled, scaberulous on the keel and minutely so on the flanks, emarginate at the apex or sometimes with a short mucro from the bilobed apex; the upper 8-11 mm. long, truncate at the apex or shortly mucronate from a subbifid apex; smooth on flanks and keel. *Lemma* 7-11 mm. long, somewhat laterally compressed, smooth or sometimes scaberulous on the keel, narrowed upwards but not forming a column; *callus*  $\pm$  1 mm. long, obtuse, densely or shortly bearded; awns flattened, scabrous, erect or slightly spreading, subequal, the central 9-15 mm. long, the lateral 7-13 mm. long.

#### CAPE PROVINCE.

Vryburg distr.: Vryburg, Armoedsvlakte, III. 1920, *Theiler* H. 20182 (N) et H. 20240 (N). Taungs distr.: Dryharts, I. 1923, *Henrici* 39 (N).



## ORANGE FREE STATE.

Bloemfontein distr.: Bloemfontein, III. 1917, *Potts* 2407 (K, N, W) et 2894 (K); Glen, III. 1926, *Agricult. School* 3447 (N). Kroonstad distr.: Vals Rivier, II. 1929, *Pont* 149 (GU, N, Z). Heilbron distr.: Heilbron, I. 1931, *Goossens* 425a (GU, N, W) et 566 (GU, N, W). Vredefort distr.: Reitzburg, II. 1937, *Bunting* 113 (N); Schoemans drift, II. 1937, *Bunting* 108 (N).

## TRANSVAAL PROVINCE.

Bloemhof distr.: Christiana, III. 1912, *Burt Davy* 13057 (N); Kameelpan, I. 1934, *Theron* 548 (N) et 550 (N). Wolmaransstad distr.: Wolmaransstad, *Cronje* 7643 (K, N). Potchefstroom distr.: Ventersdorp, III. 1931, *Pole Evans* 3143 (B, N); Machavie, III. 1927, *Lane* 9 et 9b et 14 et 18 (omnes N); Klerksdorp, IV. 1937, *Rose Innes* 964 (N) et 965 (N); Rhenosterfontein, IV. 1937, *Rose Innes* 966 (N). Vereeniging distr.: Leeuwkuil, *Bunting* 136 (N). Krugersdorp distr.: Hekpoort, IV. 1936, *Bunting* 44 (N) et 30 (N) et VIII. 1936, *Bunting* 47 (N). Pretoria distr.: Pretoria, II. 1933, *Phillips* 3625 (N); do., XII. 1933, *Barrie* in Hb. Stell. 19671 (St). Waterberg distr.: Warmbaths, II. 1921, *Stent* H. 21573 (N, W); do., I. 1936, *Irvine* 15 (N); Nylstroom, IV. 1927, *Straker* 11 (K, N); Naboomspruit, III. 1919, *Galpin* M. 426 (N).

## TYPE SPECIMEN.

*Cronje* 7643 is deposited in The Herbarium, Royal Bot. Gardens, Kew.

## COMMON NAMES.

Steekgras(s).

## ECONOMIC NOTES.

This species is very wiry and thus unpalatable.

35. *A. monticola* *Henrard* Crit. Rev. 2. 355 (1927); *Henrard Monogr.* 2. 220 cum ic. tab. 101 (1932).

*Perennial*, usually caespitose, but sometimes assuming an almost creeping habit, rooting at the lowermost nodes. *Culms* erect or geniculately ascending, including the panicle up to 80 cm. high, many-noded, usually giving rise to branches at the nodes; internodes elegant, terete, wiry, scarcely 1 mm. thick, glabrous, striate, exserted. *Leaf-sheaths* short or about one half the length of the internodes, terete, tight, glabrous and striate. *Ligule* a thickened shortly ciliate rim; auricles long-bearded; collar glabrous; blades narrow linear, flat or convolute at the base, glaucous, up to 12 cm. long and 2 mm. wide, glabrous on the lower surface, upper surface scaberulous and at times with some scattered long hairs, margins markedly thickened, acute, curved or flexuous. *Panicle* erect, lanceolate in outline, up to 14 cm. long; rhachis scaberulous and striate; branches usually binate, scaberulous, striate, ascending or almost adpressed; pedicels longer or shorter than the glumes. *Spikelets* erect, dull purplish-brown. *Glumes* linear-lanceolate, 1-nerved; the lower 6-8.5 mm. long, shortly awned, glabrous except for the scabrous keel; the upper glabrous, 5-6 mm. long, bidentate at the apex with a very short mucro from the sinus. *Lemma* tubulose, purple, smooth, 6-6.5 mm. long, produced into a distinctly twisted short scabrous column; *callus* very short, rounded, obtuse, long-bearded; awns unequal, sub-erect or divergent, the central up to 18 mm. long, the lateral branches up to 13 mm. long.

## NATAL PROVINCE.

Ipolela distr.: Underberg, III. 1938, *McClellan* 683 (N). Bergville distr.: Mt. Aux Sources, IV. 1919, *Mogg* 5282 (N) et H. 20634 (K, N); do., II. 1926, *Bayer et McClellan* 154 (K, N) et 157 (K, N). Champagne Castle, X. 1933, *Meebold* NH. 15728 (N).

## TYPE SPECIMEN.

*Mogg* H. 20634 is deposited in The Herbarium, Royal Botanic Gardens, Kew.

## ECONOMIC NOTES.

This species has a very restricted geographic distribution. It has so far only been recorded from the Drakensberg area in Natal. The plants often form a dense tangle along the banks of streams and are also commonly met with in the more open parts of the bush along the mountain gulleys.

36. *A. junciformis* Trin. et Rupr. Spec. Gram. Stip. 143 (1842); Walp. Ann. Bot. **3**. 745 (1852); Steud. Syn. Pl. Glum. **1**. 140 (1854); Dur. et Schinz, Consp. **5**. 804 (1894); Stapf in Dyer, Fl. Cap. **7**. 556 (1899); Stent in Bothalia **1**. IV. 277 (1924) pro parte; Henrard Crit. Rev. **2**. 273 (1927); Henrard Monogr. **2**. 287 cum ic. tab. 140 (1932); Obermeijer, Schweickerdt et Verdoorn in Bothalia **3**. II. 227 (1937).

*A. Adscensionis* Linn. sec. Phillips in Ann. S. Afr. Mus. **16**. 346 (1917) pro parte, non Linn. *A. angustata* Stapf in Dyer, Fl. Cap. **7**. 556 (1899); Phillips in Ann. S. Afr. Mus. **16**. 346 (1917); Henrard Crit. Rev. **1**. 26 (1926). *A. Burkei* Stapf sec. Phillips in Ann. S. Afr. Mus. **16**. 347 (1917) pro parte, non Stapf. *A. Welwitschii* Rendle, Cat. Afr. Pl. Welw. **2**. I. 202 (1899); Henrard Crit. Rev. **3**. 682 (1928); Henrard Monogr. **2**. 228 cum ic. tab. 107 (1932); Theron in Fedde, Rep. **40**. 21 (1936) [*sphalm. Welwitschia*].

*Perennial*, loosely to densely caespitose. *Culms* fascicled, erect, simple or scantily branched, wiry, 3–4-noded, up to 60 cm. high; internodes exerted, glabrous, compressed below the nodes; nodes slightly swollen, glabrous. *Leaf-sheaths* tight, the lower often keeled, glabrous or woolly, at times slipping from the internodes; *ligule* a short ciliate rim; auricles bearded or even glabrous; collar glabrous; *blades* very narrow, gradually passing into the sheaths, subsetaceous, convolute or folded below, fairly rigid or curved or flexuous, up to 30 cm. long and 1 mm. wide, smooth on the lower surface, scaberulous to densely pubescent above. *Panicle* narrow, up to 20 cm. long and 1–3 cm. broad, erect or somewhat nodding, rhachis straight or flexuous, angular; branches solitary, up to 5 cm. long, usually scantily branched from the base; branchlets scaberulous; pedicels short or almost 0. *Spikelets* purplish to green or pallid, 7–11 mm. long, congested at the tips of the branches. *Glumes* unequal, linear-lanceolate, thin, glabrous or minutely pubescent, subacute to acute and awned; the lower 4–9 mm. long, scabrous dorsally and on the keel; the upper 8–12 mm. long, awned. *Lemma* linear, tubular, up to 9 mm. long including the column, smooth or scaberulous below the column; *callus* about 0.5 mm. long, obtuse; column of awns present and well-developed or almost 0; central awn 12–35 mm. long; lateral awns 9–28 mm. long.

## SOUTH WEST AFRICA.

Otjisingombe, II. 1939, *Volk* 1175 (D); Okavango river, anno 1939, *Volk* 2146 (D).

## CAPE PROVINCE.

Ceres distr.: Koudebokkeveld, Schurfdeberg, I. 1897, *Schlechter* 10184 (A, B, BH, BM, G, N, P, T, W, Z); Matroosberg, I. 1917, *Phillips* 2108 (S). Tulbagh distr.: Tulbagh, II. 1896, *Schlechter* 7509 (A, B, BH, BM, K, P, T, V, W, Z). Worcester distr.: Worcester, *Rehmann* 2582 (BM, Z) et 2587 (K, BM, Z) et 2667 (K, BM, Z). Paarl distr.: Bainskloof, II. 1897, *Schlechter* 10258 (A, B, BH, BM, G, N, P, V, W, Z); do., IV. 1915, *Bolus* 14742 (BH, Z). Stellenbosch distr.: Stellenbosch, anno 1925, *Duthie* 1658 et 1658a (Sreg); do., anno 1926, *Duthie* in Hb. Stell. 1476 (Sreg). Cape distr.: Cape Peninsula, II. 1897, *Wolley-Dod* 2387 (BH, BM) et 2388 (BH, BM); do., *Hitchcock* 24059 (K, N, W); do., *Bolus* 14703 (A, BH, K, N, T, Z) et 21785 (BH); do., VIII. 1936, *Acock* 679 (Mc); do., IV. 1936, *Adamson* 897 (U); do., III. 1922, *Pole Evans* 492 (N). Caledon distr.: Palmiet Rivier, II. 1932, *Levy* 3841 (U); Rivierzondereinde, I. 1896, *Schlechter* 9896 (A, B, BH, BM, G, N, P, T, V, W, Z). Swellendam distr.: Grootvaderbosch, *Marloth* 3706 (B, N); Buffeljagtrivier, I. 1893, *Schlechter* 2073 (A, B, BM, G, K, P, V, Z); Zuurbraak, I. 1893, *Schlechter* 2121 (A, B, BH, BM, G, K, P, V, Z). Riversdale distr.: Riversdale, IV. 1926, *Muir* 3616 (N) et 3910 (N). George distr.: George, III. 1893, *Schlechter* 2403 (A, B, BH, BM, G, K, P, V, Z); do., VIII. 1935, *Baker* 19 (N). Humansdorp distr.: Between

Essenbosch and Two Streams, V. 1923, *Fourcade* 2543 (K, N). Uitenhage distr.: Thornhill, III. 1911, *Pillans* 1788 (K, N). Port Elizabeth distr.: Port Elizabeth, V. 1902, *Galpin* 6385 (A, N). Albany distr.: Albany, *Bowie* 23 (BM). East London distr.: Near East London, III. 1890, *Sim* 29 (Z). Kingwilliamstown distr.: Kei Road, II. 1928, *Ranger* 51 (N); *Perie*, XI. 1901, *Sim* 2835 (A, BM). Cathcart distr.: Windvogelsberg, *Baur* 1115 (A, K). Queenstown distr.: Sterkstroom, XI. 1901, *Sim* 2734 (A) et 2735 (A). Komgha distr.: Komgha, III. 1893, *Flanagan* 1777 (A, BH, N) et II. 1894, *Flanagan* 2218 (A, N). Kentani distr.: Kentani, *Pegler* 238 (A, BH, N). Engcobo distr.: Near Engcobo, I. 1896, *Flanagan* 2799 (BH, K, N). Lusikisiki distr.: Port St. Johns, IV. 1899, *Galpin* 2875 (A, K, N). Maclear distr.: Maclear, III. 1904, *Galpin* 6901 (A, B, BH, D, K, N, S); *do.*, I. 1923, *Britten* 4542 (A) et 4607 (A). Without precise locality: *Carmichael* s.n. (BM); Pondoland, *Bachmann* 168 (B) et 169 (B) et 170 (B).

#### NATAL PROVINCE.

Richmond distr.: Richmond, III. 1934, *Lynes* 650a (BM). Durban distr.: Port Natal, *Drège* (B, LG, N, V); Durban, *Williamson* 34 (K); *do.*, *Kuntze* s.n. (K); *do.*, *Plant* 61 (BM, K, O, P, V); *do.*, *Grant* s.n. (K); *do.*, *Schweickerdt* 1349 et 1351-1353 (B, D, K, L, P, V, W, Z). Inanda distr.: Inanda, *Rehmann* 8251 (V, Z). Camperdown distr.: Varkkop (Vaalkop?), *Rehmann* 7665 (A, BH, BM, V, Z). Pietermaritzburg distr.: Pietermaritzburg, III. 1926, *McClellan* 198 (K, W); *do.*, Fort Napier, *Steinbart* s.n. (B). Lions River distr.: Karkloof, IV. 1896, *Wylie* 7691 (D); Balgowan, IV. 1919, *Mogg* 3877 (N) et 3878 (N). Lidgetton, IV. 1917, *Mogg* 544 (N). Estcourt distr.: Mooi River, V. 1917, *Mogg* 126 (N) et III. 1920, *Mogg* 7249 (N); *do.*, XII. 1928, *Mason* 4 (D, K); *do.*, *Rehmann* 7342 (B, BM, K, Z); Giant's Castle, XII. 1914, *Symons* 279 (T). Bergville distr.: Mt. Aux Sources, IV. 1919, *Mogg* 5310 (N); *do.*, II. 1926, *Bayer et McClellan* 219 (K, N). Dundee distr.: Near Dundee, *Medley Wood* 7449 (K). Newcastle distr.: Mount Prospect, *Bunting* 177 et 181 (N). Zululand: Entonjaneni distr.: Melmoth, V. 1919, *Mogg* H. 20041 (N, W). Lower Umfolozi distr.: Mtunzini, V. 1919, *Mogg* H. 20040 (N). Without precise locality: *Hutton* 327 (A, V); *Buchanan* 1 (K); *Sutherland* s.n. (K); *Plant* 11 (G); *Jenkinson* 64 (D, K).

#### BASUTOLAND.

Leribe distr.: Leribe, *Dieterlen* 199b (K, N, P, V, W); *do.*, II. 1913, *Phillips* 638 (K, S) et 692 (S) et 734 (S) et 741 (S) et 790 (S) et 919 (S).

#### ORANGE FREE STATE.

Senekal distr.: Doornkop, XII. 1931, *Goossens* 889 (B, K, N, W); Wonderkop, XII. 1931, *Goossens* 834 (K, N) et 841 (K, N). Bethlehem distr.: Bethlehem, II. 1919, *Potts* 4517 (GU, N); *do.*, *Richardson* s.n. (B, K, P, V, W, Z). Kroonstad distr.: Bothaville, I. 1933, *Goossens* 1179 (B, N). Heilbron distr.: Viljoensdrift, I. 1912, *Rogers* 4824 (A, K, T). Vrede distr.: Vrede, V. 1937, *Bunting* 185 (N). Without precise locality: *Buchanan* 55 (D) et 64 (D) et 67 (BH, D, K) et 289 (D, K).

#### TRANSVAAL PROVINCE.

Wakkerstroom distr.: Amersfoort, III. 1917, *Burt Davy* 17362 (K). Ermelo distr.: Ermelo, III. 1917, *Burt Davy* 17426 (W) et 17467 (K); *do.*, II. 1910, *Burt Davy* 9267 (N) et 9320 (N) et I. 1904, *Burt Davy* 950 (N); *do.*, XII. 1926, *Henrici* 1217 (N); *do.*, I. 1936, *Norval* 102 (N); Lake Chrissie, III. 1904, *Hamilton* H. 994 (N) et IV. 1910, *Hamilton* 5913 (N). Standerton distr.: Standerton, V. 1937, *Bunting* 123 (N). Heidelberg distr.: Henley-on-Klip, II. 1922, *Stent* H. 21135 (N); Uitgevalen, XII. 1909, *Burt Davy* 9185 (N). Vereeniging distr.: Vereeniging, II. 1917, *Burt Davy* 17093 (BH, K) et III. 1917, *Burt Davy* 17206 (BH, K). Leeuwkuil, XII. 1935, *Story* 5 (N). Johannesburg distr.: Johannesburg, XI. 1902, *Rand* 1044 (BM); Frankenswald, I. 1937, *Bunting* 90 (N). Pretoria distr.: Pretoria, XII. 1917, *Burt Davy* 7494 (N); Koedoespoort, *Rehmann* 4640 (B, V); *do.*, XI. 1915, *Mogg* 11798 (N). Zilikaatsnek, IV. 1918, *Pole Evans* H. 17587



(N); Irene, I. 1922, *Pole Evans* 359 (N). Rustenburg distr.: Holfontein, *Nelson* 79 (K). Waterberg distr.: Elandspruitbergen, XII. 1893, *Schlechter* 3998 (A, B, BH, BM, G, K, T, V, Z); Warmbaths, II. 1921, *Stent* H. 21450 (N); Naboomspruit, IV. 1924, *Galpin* H. 712 (N) et II. 1919, *Galpin* M. 423 (K, N); Pietpotgietersrust, III. 1921, *Galpin* 8889 (K); Pongola River, XII. 1919, *Burt Davy* 18264 (K). Pietersburg distr.: Houtbosch, *Rehmann* 5665 (Z) et 6567 (K, V, Z). Zoutpansberg distr.: Zoutpan, IV. 1934, *Schweickerdt et Verdoorn* 572 (N, B).

#### BECHUANALAND PROTECTORATE.

Kanye, III. 1937, *Bunting* 132 (N).

#### TYPE SPECIMEN.

*Drège* (Port Natal?) is deposited in the Trinius Herbarium, Leningrad.

#### COMMON NAMES.

Heigras. Koperdraat. Wire-grass.

#### ECONOMIC NOTES.

This species is tough and wiry and thus from a forage point of view, useless.

#### REMARKS.

The spikelets of this species show a great deal of variation. One and the same specimen (*Flanagan* 2218) shows the following ranges: Lower glume 7–9 mm., upper glume 8–12 mm., lemma 6–9 mm., central awn 12–34 mm., and lateral awns 9–28 mm. long. The length of the column likewise is extremely variable. *Galpin* 6901 shows the presence of spikelets in which the column is well-developed and exserted beyond the glumes, whereas in others of the same gathering the column is only weakly developed and thus not exserted beyond the glumes.

From the foregoing synonymy it is evident that I do not consider *A. angustata* Stapf to be specifically distinct from *A. junciformis*. The reason is that *Wolley-Dod* 2387 and *Rehmann* 2582, syn-lectotypes of Henrard, have culms which are distinctly compressed below the nodes, furthermore the lemmas are not always exserted beyond the shortly mucronate glumes. The most important characters of distinction thus break down.

Examination of Rendle's types of *A. Welwitschii* in the British Museum have also revealed the presence of culms which are compressed below the nodes. This also holds good for the *var. minor* of Rendle. These specimens are not distinguishable from *A. junciformis* on the character just mentioned.

Since Henrard considers *A. Welwitschii* to be synonymous with *A. angustata* and on which point I fully agree, I have not been able to arrive at a view other than that expressed in the synonymy cited above for this species.

37. *A. transvaalensis* Henrard Crit. Rev. Suppl. 742 (1933); Henrard Monogr. 2. 235 cum ic. tab. 111 (1932).

Densely caespitose *perennial*. Culms erect, simple below, branched from most of the nodes, more rarely simple, erect, elegant, few to many-noded, including the panicles up to 70 cm. high; internodes glaucous, striate, terete, smooth or very minutely scaberulous, exserted from the leaf sheaths, lowermost internode usually long (up to 30 cm. !); nodes inconspicuous, glabrous. Basal leaves pallid, slipping from the stems; lower sheaths striate, somewhat compressed or subterete, glabrous, with somewhat hyaline margins; the upper sheaths lax and slipping from the internodes or fairly tight and not slipping from the internodes; ligule minute and shortly ciliate; auricles minutely bearded; collar glabrous; the basal blades soon dying off, linear, acute, recurved or flexuous, striate, lower surface glabrous, scabrous on the upper surface, convolute; the upper narrow convolute about 1 mm. wide (when opened out), setaceous, acute, flexuous or somewhat curved,



up to 15 cm. long, striate, glabrous beneath, scaberulous and with prominently thickened marginal veins above, margins minutely serrate. *Panicle* narrow, somewhat lax, up to 8 cm. long, scarcely or well-exserted; axis more or less terete or subangular, scaberulous or smooth; branches solitary, bipartite from the base, up to 2.5 cm. long, erect and adpressed, bearing spikelets to the base or shortly peduncled and with erect branchlets; pedicels scabrous. *Spikelets* congested, shortly pedicelled, pallid or dull-purplish or greenish, small, erect. *Glumes* lanceolate, unequal, 1-nerved, acute; the lower 5–9 mm. long, shortly awned, upwards scabrous on the keel; the upper 6.5–10 mm. long, minutely subtruncate at the apex and awned, glabrous on the keel. *Lemma* smooth, minutely granular upwards, tubulous, together with the column up to 11.5 mm. long, narrowed above and stipitate or with a well-developed column; *callus* very short (0.3 mm.), very obtuse, almost truncate, densely hairy; column 1–5.5 mm. long, scabrous, twisted; awns unequal, scabrous; the central divergent (almost geniculately so) and 6–13 mm. long; the lateral at times absent, more usually present and up to 8 mm. long.

#### NATAL PROVINCE.

Newcastle distr.: Mount Prospect, V. 1937, *Bunting* 177 (N).

#### TRANSVAAL PROVINCE.

Potchefstroom distr.: Klerksdorp, XI. 1937, *Bunting* 158 (N). Krugersdorp distr.: Krugersdorp, II. 1937, *Bunting* 139 (N) et 141 (N). Johannesburg distr.: Johannesburg, III. 1920, *Burt Davy* 18880 (K, N); do., V. 1915, *Burt Davy* 15255 (BH, N); do., VII. 1929, *Hitchcock* 24116 (K, N, W); do., I. 1919, *Bryant* A. 25 (N, W); do., IV. 1927, *Moss* 14258 (WR); do., I. 1922, *Moss* 6337 (WR); do., III. 1920, *Moss* 3575 (K, WR, W); Frankenwald, II. 1937, *Bunting* 95 et 97 et 164 et 188 (omnes N). Pretoria distr.: Pretoria, IX. 1905, *Engler* 2761 (B); Wonderboom, IV. 1932, *Smith* 6113 (N) et 6198 (K, N); do., II. 1933, *Phillips* 3524 (N). Koedoespoort, *Rehmann* 4620 (Z); do., II. 1939, *Schweickhardt* 1327 et 1331 et 1332 (omnes B, K, N, W); Baviaanspoort, IV. 1927, *Moss* 14259 (K, N, WR). Barberton distr.: Barberton, V. 1930, *Thorncroft* 21 (B, K, N).

#### BECHUANALAND PROTECTORATE.

Kanye, III. 1937, *Bunting* 132 (N).

#### TYPE SPECIMEN.

*Moss* 14259 is deposited in The Herbarium, Royal Botanic Gardens, Kew.

#### ECONOMIC NOTES.

Owing to the wiry nature of the culms and the scantiness of leaf, this species most probably is unpalatable.

#### REMARKS.

In this species the lateral awns are not always well-developed. *Thorncroft* 21 has several inflorescences in which they are absent or merely weakly developed, so that the spikelets superficially resemble those of *Stipa parvula* Nees. The same gathering also shows inflorescences with lemmas in which the lateral awns are well-developed, thus proving that the length of the lateral awns is extremely variable. The length of the column of the awns is likewise extremely variable even in one and the same individual.

This species grows in close proximity to *A. aequiglumis* Hack. but may be distinguished from this by the comparatively more-contracted inflorescence and smaller spikelets. The branching of the culms is not a critical character since it also occurs in *A. aequiglumis* though far less frequently so. *A. transvaalensis* is very commonly met with on the northern slopes of the Magaliesberg where it grows in the crevices on quartzite and forms dense tussocks.

38. *A. aequiglumis* Hack. in Bull. Herb. Boiss. **3**. 381 (1895); Stapf in Dyer, Fl. Cap. **7**. 555 (1899); Henrard Crit. Rev. **1**. 18 (1926); Henrard Monogr. **2**. 236 cum ic. tab. 112 (1932); Theron in Fedde, Rep. **40**. 21 (1936).

*Perennial*, densely caespitose, up to 70 cm. high, but usually much smaller. *Culms* slender, simple, erect, terete, 3-4-noded, rarely branched from the nodes; internodes glabrous, striate, exserted. *Leaf-sheaths* persistent, shorter than the internodes, striate glabrous, the lower pallid; *ligule* a minutely ciliate rim; auricles minutely pubescent, more rarely bearded with a few long white hairs; *blades* setaceous, convolute, rather firm, recurved or flexuous, up to 15 cm. long but often much shorter, finely striate and glabrous on the lower surface, minutely pubescent and striate on the upper surface, margins scabrous. *Panicle* linear-oblong, contracted or lax and open but never spike-like, about 10 cm. long, rarely somewhat longer; rhachis filiform; branches remotely 2-3-nate or the upper solitary, erect and almost adpressed to the rhachis, the longest up to 6 cm. long, usually branched from near the middle and bearing 1-3 spikelets on short scaberulous pedicels. *Glumes* linear-lanceolate, 1-nerved; the lower rather broad at the base, 7-11 mm. long, with a prominent and scabrous or glabrous midrib, acute or shortly mucronate from a minutely 2-lobed apex, dorsally minutely scaberulous to conspicuously scabrid-hairy on the flanks, usually somewhat recurved near the apex; the upper 7-11.5 mm. long, midrib conspicuous and glabrous, scaberulous dorsally and often scabrid-hairy on the flanks, shortly mucronate from a minutely 2-lobed apex, often recurved at the apex. *Lemma* linear-convolute, including the callus and twisted scaberulous column from 8-16 mm. long, dorsally minutely scaberulous upwards; column 2-8 mm. long; awns capillary, suberect or slightly spreading, scaberulous; the central 15-30 mm. long; the lateral awns somewhat shorter, 14-28 mm., long. *Anthers* 4 mm. long, pale yellow to purple. *Stigmas* an intense purple, 2.5 mm. long.

#### TRANSVAAL PROVINCE.

Potchefstroom distr.: Losberg, XII. 1934, *Theron* 941 (T); do., IV. 1937, *Bunting* 166 (N); do., Rhenosterfontein, IV. 1937, *Bunting* 167 (N). Krugersdorp distr.: Hekpoort, V. 1936, *Bunting* 68 (N) et III. 1937, *Bunting* 610 et 148 (N); near Robinson, III. 1928, *Moss* 16501 (K, WR, W). Johannesburg distr.: Johannesburg, XII. 1908, *Leendertz* 1823 (T); do., VII. 1929, *Hitchcock* 24124 (K, N, W); do., II. 1928, *Moss* 16250 (K, N, WU); do., IV. 1911, *Pillans* 1814 (K); do., III. 1920, *Burt Davy* 18907 (K); Frankenwald, II. 1937, *Bunting* 96 (N) et 99 (N); Witwatersrand, IV. 1895, *Hutton* 883 (A). Pretoria distr.: Pretoria, *Pont* 958 (Z) et 1076 (Z); do., IV. 1930, *Mogg* 8440 (K, N); do., I. 1894, *Schlechter* 4150 (Z); Koedoespoort, *Rehmann* 4696 (B, K, N, V, Z); do., II. 1929, *Stent et Mogg* 8099 (N); do., III. 1939, *Schweickerdt* 1342-1344 (K, N, B, V, W); Saartjiesnek off Pelindaba Road, II. 1939, *Schweickerdt* 1328 et 1329 et 1330 (omnes B, K, N, W). Middelburg distr.: Wilge Rivier, I. 1894, *Schlechter* 4129 (A, BH, BM, K, N, T, V) et 4129a (Z); Balmoral, IV. 1917, *Pole Evans* H. 11638 (K). Waterberg distr.: Nylstroom, IV. 1932, *Skead* 30 (N); Naboomspruit, IV. 1924, *Galpin* M. 713 (N).

#### TYPE SPECIMEN.

*Rehmann* 4696 is deposited in the Naturhistorisches Museum, Wien.

#### REMARKS.

Henrard in his Monogr. **2**. 236 states the lower glume to be "glabrous and smooth, minutely pubescent only at the tip". He uses this as a diagnostic character to distinguish between *A. aequiglumis* and *A. huillensis*. Careful examination of Hackel's type has shown that the lower glume is often scaberulous on both the keel and the flanks and also from the base upwards. A drawing made by Stapf of some of the type gathering in Herb. Kew. also shows the glumes to be scaberulous. In the various sheets enumerated above I have found the lower glume to be scaberulous or even shortly hairy dorsally to a greater or lesser degree. Some spikelets may be almost glabrous and smooth (*Hutton* 883) whereas in the same gathering others again are markedly hairy. It thus appears that the degree

of indumentum of the glumes is of relatively little taxonomic importance. As some specimens of *A. aequiglumis* have branched culms and this is always met with in *A. huillensis*, it is extremely doubtful whether these plants really represent distinct species.

A wide range of material from the type locality and another locality has been collected recently by the author of this paper. These specimens clearly show the range in variation of the species.

39. *A. rhiniochloa* Hochst. in Flora **38**. 200 (1855); Dur. et Schinz, Consp. **5**. 808 (1894) [sphalm. *rhinochloa*]; Dinter in Fedde, Rep. **15**. 342 (1918) [sphalm. *rhinochloa*]; Henrard Crit. Rev. **3**. 510 (1928); Henrard Monogr. **2**. 242 cum ic. tab. 115 (1932); Range in Fedde, Rep. **33**. 9 (1933).

*A. rigidiseta* Pilger in Engl. Bot. Jahrb. **51**. 413 (1914); Garabedian in Ann. S. Afr. Mus. **16**. II. 404 (1925); Henrard Crit. Rev. **3**. 516 (1928).

Erect annual, branched from the base and not infrequently from the lower and middle nodes. Culms usually erect, very rarely geniculately ascending, 3 to many-noded; internodes, terete, exceeding the lower leaf-sheaths, retrorsely scabrous, striate; nodes minutely pubescent. Lower leaf-sheaths usually slipping off the stem, compressed, keeled, striate, scabrous, the upper likewise but usually exceeding the internodes; ligule long-ciliate; auricles long-bearded; blades flat, up to 20 cm. long and 4 mm. wide, glaucous, many-nerved, very scabrous on both surfaces, acute but not pungent. Panicle effuse or contracted, up to 30 cm. long; axis very scabrous, striate; branches scabrous, the axils densely shortly hairy, binate, more or less peduncled with 1 or 2 few-flowered short branchlets at the base, upper branches shortly peduncled mostly solitary, bearing clustered spikelets on subsessile pedicels or some of them with well-developed pedicels. Spikelets coarse, pallid or purplish-brown, flushed with purple towards the base of the glumes. Glumes broad, very acute, shortly hairy on the back, 1-nerved, keels somewhat scabrous, awned; the lower broadly lanceolate, acuminate, including the awn up to 17 mm. long, but usually about 13 mm. long; the upper broadly-lanceolate, with two lateral teeth at the apex below the awn, up to 15 mm. long or somewhat shorter. Lemma including the densely hairy subobtusate callus up to 13.5 mm. long, usually somewhat shorter (11 mm.), strongly nerved, the nerves with rows of aculeolate antrorsely curved hyaline sharp hairs, keeled dorsally and deeply grooved ventrally with inrolled margins; awns very scabrous, rigid, triquetrous, almost winged at the base, erect or spreading, subequal or the central somewhat longer, 18–30 mm. long or at times up to 40 mm. long.

#### SOUTH WEST AFRICA.

Otjikuara-Okaharui, III. 1913, Dinter 3292 (B); Otavi, III. 1925, Dinter 5754 (BH, G, GU, N, S, Z); Omuramba und Omatako, III. 1912, Seiner 691 a (41 a) (B); Okahandja, Dinter 1551 (B); do., II. 1928, Bradfield 393 (N) et V. 1928, Bradfield 393 a (K, N), Okahandja-Otjisara, III. 1912, Dinter 2535 (B); Okawaka, I. 1939, Volk 598 (D); Otjiputo; II. 1939, Volk 1251 (D); Otjenga, III. 1939, Volk 1395 (D).

#### TRANSVAAL PROVINCE.

Waterberg distr.: Crecy, Carver 20 (N) et 24 (N). Zoutpansberg distr.: Messina, X. 1929, Turner 16 (N).

#### BECHUANALAND PROTECTORATE.

Francistown, IV. 1929, Gordon 66 (N).

#### TYPE SPECIMEN.

The whereabouts of the actual type, *Buchinger* 1229 leg. *Schimper*, is not known, although duplicates of the type are deposited in several herbaria (B, P?).



40. *A. andoniensis* Henrard Crit. Rev. 3. 691 (1928); Henrard Monogr. 2. 243 (1932).

The habit of this interesting species is not known since it has been described from incomplete material. *Panicle* up to 28 cm. long and 2 cm. wide. *Culms* puberulous and striate below the panicle; rhachis puberulous, striate and angular; branches binate, erect, naked at the base for 1.5–2 cm., axils minutely pubescent; pedicels scabrous, the lateral very short, the terminal up to as long as the glumes. *Spikelets* purple. *Glumes* subequal; the lower 15–16 mm. long, dorsally pubescent, acute, shortly awned; upper glume 14 mm. long, with a 1 mm. long awn from the bifid apex. *Lemma* including the callus up to 12 mm. long, margins inrolled, furrowed ventrally, slightly keeled, glabrous and smooth, minutely scaberulous on the keel; *callus* obtuse, about 1 mm. long; awns erect, triquetrous, winged, very scabrous, up to 30 mm. long.

SOUTH WEST AFRICA.

Andoni, anno 1921, *Barnard* 814 (K, N, S).

TYPE SPECIMEN.

*Barnard* 814 is deposited in The Herbarium, Royal Botanic Gardens, Kew.

REMARKS.

This species is only known from the above type gathering which consists of rather incomplete material.

41. *A. Hubbardiana* Schweickardt in Notizbl. Bot. Garten u. Mus. Berlin—Dahlem. 14. nr. 122. 196 (1938).

A slender *annual*. *Culms* erect or somewhat geniculately ascending, up to 50 cm. high, not very rigid, about 7-noded, markedly branched from the nodes; internodes up to 10 cm. long, always exserted, subterete or compressed, striate and glabrous; nodes glabrous and always exserted. *Leaf-sheaths* about 2.5–3 cm. long, glabrous, striate, compressed, slightly keeled, lax, scaberulous towards the margin, always shorter than the respective internode and smooth. *Ligule* reduced to a ring of short hairs; auricles glabrous more rarely somewhat bearded. *Leaf-blades* up to 12 cm. long but often much shorter, flat or conduplicate, about 2 mm. wide, the margins minutely scaberulous and involute upwards, glabrous and striate on the lower surface, upper surface striate, minutely scaberulous and bearing a few long hairs towards the ligule. *Panicle* well-exserted, up to 6 cm. long, densely glomerate and spike-like, obovate in outline; rhachis striate, angular; branches very short and scaberulous. *Spikelets* densely congested, subsessile, lanceolate. *Glumes* about 7 mm. long, subequal, linear-lanceolate; the lower awned often from a bifid apex, awn and keel scaberulous, minutely scaberulous upwards towards the margin; the upper emarginate and shortly awned, keel glabrous, slightly scaberulous upwards towards the margin. *Lemma* lanceolate, up to 7 mm. long, 3-nerved, markedly scabrous in its upper two-thirds, glabrous towards the base, the margins more or less involute. *Callus* very short, rounded, densely bearded. Awns scabrous, up to 30 mm. long, the lateral often much shorter.

SOUTH WEST AFRICA.

Tsumeb, IV. 1934, *Dinter* 7600 (B); Ossa, III. 1939, *Volk* 1557 (D).

TYPE SPECIMEN.

*Dinter* 7600 is deposited in the Botanisches Museum, Berlin-Dahlem. This species bears a superficial resemblance to *A. hordeacea* Kunth which, however, belongs to § *Pseudochaetaria* whereas *A. Hubbardiana* mihi must be placed in § *Chaetaria* owing to the absence of an articulation in the lemma. The nearest ally to our species is *A. elliptica* (Nees) Kunth from which it differs in several minor characters. This is another of the rather remarkable cases where two closely allied species are found in South America and Western Africa, respectively!



42. *A. recta* Franchet in Bull. Soc. d'Autun **8**. 365 (1896); Henrard Crit. Rev. **3**. 500 (1928); Henrard Monogr. **2**. 261 cum ic. tab. 125 (1932); Theron in Fedde, Rep. **40**. 22 (1936). *A. atrovioleacea* Hack. apud Schinz in Bull. Herb. Boiss. Ser. 2. **6**. 707 (1906); Henrard Crit. Rev. **1**. 45 (1926). *A. Gossweileri* Pilger in Engl. Bot. Jahrb. **39**. 598 (1907); Henrard Crit. Rev. **1**. 206 (1926). *A. Hockii* De Wildeman in Bull. Jard. Bot. Brux. **6**. 39 et tab. 35 fig. 1-6 (1919); Henrard Crit. Rev. **2**. 237 (1927).

*Perennial*, densely caespitose, erect; innovations intravaginal. *Culms* erect, exserted, elegant, 10-30 cm. high, simple, glabrous, striate, subcompressed, 1-(2)-noded; internodes included. *Leaf-sheaths* subterete, glabrous, striate; the lower somewhat lax and eventually breaking up into fibres; the upper somewhat tighter and with a submembranous margin; *ligule* a ciliolate rim; auricles bearded; collar smooth; *blades* basal, setaceous involute, about up to 20 cm. long (often much shorter) and up to 1 mm. wide, striate, smooth on the lower surface, upper surface scaberulous, subobtusate or acute, often somewhat curved or flexuous. *Panicle* ovate-lanceolate in outline, up to 8 cm. long and 4 cm. wide, lax but not very diffuse; axis filiform, smooth, scaberulous upwards, straight or more usually somewhat flexuous; branches capillary, scaberulous, flexuous, ascending, binate or 3-5-partite, naked in their lower half to one-third, the lower branches up to 3 cm. long, the upper much shorter; pedicels much longer to shorter than the glumes. *Spikelets* aggregated towards the end of the branches, brownish-purple to dark-purple. *Glumes* subequal to unequal; the lower lanceolate-ovate, shortly awned, 1-nerved, 3-keeled, scabrous along the keels, 2.5-6 mm. long; the upper linear-lanceolate, shortly awned, 1-nerved, glabrous, 5-7.5 mm. long. *Lemma* tubulous, somewhat narrowed upwards into a short column, smooth, pallid or grey in colour, scaberulous below the awns, 4-5 mm. long; *callus* about 0.25 mm. long, rounded and obtuse, shortly bearded; awns subequal, scabrous, curved or flexuous, purple.

#### SOUTHERN RHODESIA.

Salisbury, IX. 1919, *Eyles* 1795 (BH, N, S).

#### TRANSVAAL PROVINCE.

Ermelo distr.: Amsterdam, X. 1935, *Norval* 24 (N). Pretoria distr.: Premier Mine, X. 1917, *Moss* 3165 (N, WR, W).

#### NATAL PROVINCE.

Newcastle distr.: Newcastle, X. 1893, *Schlechter* 3414 (A, B, BH, BM, G, K, N, P, V, Z).

#### TYPE SPECIMEN.

*Brazza* 226 is deposited in the Museum d' Histoire Naturelle, Paris.

43. *A. Galpinii* Stapf in Kew Bull. **1910** p. 130; Phillips in Ann. S. Afr. Mus. **16**. 347 (1917); Henrard Crit. Rev. **1**. 190 (1926); Henrard Monogr. **2**. 305 cum ic. tab. 148 (1932).

*Perennial*, densely caespitose, leafy, with many innovations. *Culms* erect, simple, up to 45 or 50 cm. high but usually somewhat smaller, very elegant, glabrous, 1-2-noded, more usually one-noded; internodes compressed, striate. *Leaf-sheaths* tight; the lower pallid or often tinged with purple, persistent, striate, glabrous; *ligule* a ciliolate rim; auricles bearded with hairs up to 4 mm. long; collar glabrous; *blades* setaceous, convolute, up to 30 cm. long, acute, somewhat rigid and flexuous, often plicate, glabrous on the lower surface, scaberulous on the upper surface. *Panicle* somewhat contracted, oblong, lax and flexuous; peduncle and axis subterete and striate, scabrous; branches distant, filiform, scaberulous, solitary, about 2-flowered; pedicels scaberulous, unequal, subcompressed and clavate at the apex. *Spikelets* yellowish-brown to purple, suberect. *Glumes* 1-nerved, unequal, lanceolate, more or less abruptly acuminate and mucronate; the lower scabrous on the keel and usually so on the back, 6-10 mm. long; the upper glabrous on the keel

but usually scabrous on the back, 9–14 mm. long. *Lemmatubulous* or lanceolate, narrowed upwards into the short beak, purplish, glabrous or minutely scaberulous dorsally upwards, 7–9 mm. long; *callus*  $\pm$  1 mm. long, shortly and densely bearded, obtuse; awns setaceous, spreading, subequal, the central up to 25 mm. long, the lateral up to 20 mm. long.

#### CAPE PROVINCE.

Kingwilliamstown distr.: Keiskama Hoek, XII. 1925, *Dyer* 257 (A, N, W); do., II. 1924, *Schönland* 4459 (A); Hogs Back, I. 1920, *Rattray* 440 (A). Stutterheim distr.: Glencairn, IV. 1928, *Galpin* 2417 (A, K, N). Barkly East distr.: Ben McDhui, III. 1904, *Galpin* 6900 (A, B, D, K, N, S). Mount Currie distr.: Kokstad, IV. 1918, *Mogg* 5013 (N).

#### NATAL PROVINCE.

Bergville distr.: Mt. Aux Sources, II. 1926, *Bayer et McClean* 24 (K, N, W).

#### BASUTOLAND.

Maluti mountains, *Staples* 112 (N).

#### TYPE SPECIMEN.

*Galpin* 6900 is deposited in The Herbarium, Royal Botanic Gardens, Kew.

#### ECONOMIC NOTES.

This species is considered unpalatable even in the young condition.

44. *A. curvata* (Nees) Trin. et Rupr. Spec. Gram. Stip. 133 (1842); Walp. Ann. Bot. **3**. 743 (1852); Steud. Syn. Pl. Glum. **1**. 138 (1854); Dur. et Schinz, Consp. **5**. 802 (1894); Henrard Crit. Rev. **1**. 124 (1926); Henrard Monogr. **2**. 318 cum ic. tab. 156 (1932); Range in Fedde, Rep. **33**. 8 (1933).

*A. curvata* (Nees) Trin. et Rupr. var. *nana* (Nees) Henrard Crit. Rev. **3**. 487 (1928); Henrard Monogr. **2**. 318 (1932); Range in Fedde, Rep. **33**. 8 (1933). *A. adscensionis* L. sec. Stapf in Dyer, Fl. Cap. **7**. 554 (1899) excl. syn. pro parte; F. Bolus in Ann. S. Afr. Mus. **9**. IV. 231 (1915) pro parte; Phillips in Ann. S. Afr. Mus. **16**. 346 (1917) pro parte; Garabedian in Ann. S. Afr. Mus. **16**. II. 400 (1925); Stent in Bothalia **1**. IV. 277 (1924), omnes non Linn. *A. adscensionis* L. var. *coerulescens* (Trin. et Rupr.) Dur. et Schinz, Consp. **5**. 799 (1894) pro parte; Hack. in Bull. Herb. Boiss. **4**. Append. III. 19 (1896); Garabedian in Ann. S. Afr. Mus. **16**. II. 400 (1925), omnes non Trin. et Rupr.) Dur. et Schinz. *A. adscensionis* L. var. *pygmaea* (Trin. et Rupr.) Dur. et Schinz, Consp. **5**. 800 (1894). *A. adscensionis* L. var. *strictiflora* (Trin. et Rupr.) Dur. et Schinz, Consp. **5**. 800 (1894). *A. angustata* Stapf sec. Potts et Tidmarsh in Journ. S. Afr. Bot. **3**. III. 88 (1937), non Stapf. *A. caerulescens* Desf. var. *breviseta* Hack. in Engl. Bot. Jahrb. **11**. 400 (1889); Henrard Crit. Rev. **3**. 694 (1928). *A. confusa* Trin. et Rupr. Spec. Gram. Stip. 134 (1842); Henrard Crit. **1**. 112 (1926). *A. junciformis* Trin. et Rupr. sec. Stent in Bothalia **1**. IV. 277 (1924) pro parte, non Trin. et Rupr. *A. pusilla* Trin. et Rupr. Spec. Gram. Stip. 140 (1842); Steud. Syn. Pl. Glum. **1**. 139 (1854); Presl, Bot. Bemerk. 121 (1844); Dur. et Schinz, Consp. **5**. 807 (1894); Henrard Crit. Rev. **3**. 487 (1928). *A. pygmaea* Trin. et Rupr. Spec. Gram. Stip. 133 (1842); Walp. Ann. Bot. **3**. 743 (1852); Steud. Syn. Pl. Glum. **1**. 138 (1854); Henrard Crit. Rev. **3**. 488 (1928). *A. strictiflora* Trin. et Rupr. Spec. Gram. Stip. 134 (1842); Walp. Ann. Bot. **3**. 743 (1852); Steud. Syn. Pl. Glum. **1**. 138 (1854); Henrard Crit. Rev. **3**. 600 (1928). *Chaetaria curvata* Nees, Fl. Afr. Austr. 186 (1841). *Chaetaria curvata* Nees  $\beta$  minor Nees, Fl. Afr. Austr. 187 (1841); Presl, Bot. Bemerk. 121 (1844). *Chaetaria mauritiana* (Kunth) Nees var.  $\beta$  *Nana* Nees, Fl. Afr. Austr. 188 (1841); Presl, Bot. Bemerk. 121 (1844).

A tufted annual, including the inflorescence up to 60 cm. high or even taller, at times very much smaller and dwarfed. Culms erect or somewhat geniculately ascending, more or less branched from the base and from the lower nodes, terete, striate, smooth, the upper nodes well-exserted. Leaf-sheaths more or less shorter than the internodes, tight, often slipping from the culms, compressed and keeled, smooth to scaberulous, striate, margins hyaline; ligule a ciliate rim; auricles pubescent; collar glabrous; blades narrowly linear, tapering to a fine point, flat at the base or more usually folded throughout their length, up to 15 cm. long and 1–2 mm. wide, glabrous and striate on the lower surface, scabrous hirtellous on the upper surface, margins thickened. Panicle exserted, dense,

rather narrow, up to 20 cm. long, 1-2 cm. broad, more or less interrupted at the base, axis scabrous, terete below, angular upwards; branches scabrous, binate or branched almost from the base, the longer branches often peduncled, the shorter sessile; pedicels scabrous, fairly short. *Spikelets* yellowish, greenish or tinged with purple. *Glumes* unequal, linear-lanceolate to lanceolate-oblong; the lower 4-7 mm. long, emarginate and shortly mucronate at the apex, scabrous on the keel and strigose on the flanks, laterally compressed; the upper up to 8 mm. long, smooth on the keel below, scaberulous upwards, bifid and with a short apical mucro from the sinus. *Lemna* usually purple-mottled, compressed, punctulate all over, scabrous on the keel, at times scabrous on the flanks upwards, up to 10 mm. long; *callus* rounded, densely bearded, 0.5-0.75 mm. long; awns erect or spreading, scabrous, unequal; the central about 20 mm. long, the lateral about 15 mm. long.

#### SOUTH WEST AFRICA.

Otjinga, III. 1939, *Volk* 1396 a (D); Hollywood, II. 1939, *Volk* 1229 (D); Otjikongo, II. 1939, *Volk* 1294 (D); Asis, anno 1939, *Volk* 652 (D) et 653 (D) et 722 (D); Fockshof, anno 1939, *Volk* A. 157 (D); Ossa, III. 1939, *Volk* 1558 (D); Tsumeb, IV. 1934, *Dinter* 7444 a pro parte (G); Waterberg, V. 1928, *Bradfield* 377 (N); Spitzkopje, I. 1937, *Boss* TM. 36410 (T); Okahandja, II. 1903, *Dinter* s.n. (B, N); do., *Bertling* 14 (B); Otjimbingue, V. 1886, *Marloth* 1379 (B); Windhuk, *Bohr* 40 (B); do., III. 1910, *Mücke* 47 (N); between Mariental and Gibeon, III. 1913, *Engler* 6596 (B); Gründoon, II. 1909, *Pearson* 3118 (K, T) et 3129 (A, BH, K, N, S) et 3160 (K); Sabiesis, II. 1909, *Pearson* 4118 (K); Kunab, IV. 1911, *Range* 1007 (B); Kuibis, V. 1909, *Range* 652 (B); Schakalskuppe, VII. 1913, *Range* 1771 (B); Sardverhaar, II. 1909, *Pearson* 4625 (BH, K) et 4674 (K, N); Akam River basin, II. 1909, *Pearson* 4745 (G, K); Chamis, IX. 1905, *Schulze* 418 (B); Seeheim, II. 1909, *Schäfer* 44 (B); Gawachab, II. 1909, *Pearson* 4332 (BM, N); Klein Karas, IV. 1931, *Oertendahl* 118 (B, K, N); Noachabeb, *Blank* 53 (B); Great Karasberg, I. 1913, *Pearson* 8493 (BH, BM, K, N, S); Ganus, II. 1909, *Pearson* 4490 (K, N); Kanuchas, IV. 1912, *Range* 1399 (B).

#### CAPE PROVINCE.

Little Namaqualand distr.: Between Natvoet and Orange River, *Drège* (B, BM, K, N, O, P, S); Pella, I. 1909, *Pearson* 3557 (K); Iaus, IX. 1897, *Schlechter* 11226 (A, B, N, W); Khamiesberg, XII. 1936, *Adamson* 1547 (N). Upington distr.: Upington, VIII. 1923, *Borchards* H. 21519 (N); Riemvastmaak, VII. 1925, *Barnard* 36147 (S); Louisvale, II. 1930, *Mennell* s.n. (W). Calvinia distr.: Springbokkuil, *Zeyher* 42 (B, S); between Losper's Plaats and Springbokkuil River, *Zeyher* 1817 (BM, G, K, V, Z). Ceres distr. Yuk Rivier, VII. 1811, *Burchell* 1266 (BM, K). Prince Albert distr.: Prince Albert, XII. 1904, *Bolus* 11670 (BH); Prince Albert Road, V. 1920, *Pillans* 21783 (BH). Victoria West distr.: Nobelsfontein, II. 1931, *Thorne* 49453 (S). Murraysburg distr.: Murraysburg, *Thorne* 10635 (A, T). Graaff-Reinet distr.: Graaff-Reinet, Sunday River, *Drège* (B, BM, G, K, N, O, P); Graaff-Reinet, III. 1868, *Bolus* 678 (A, BH, BM, K, V). Somerset East distr.: Somerset East, *McOwan* s.n. (S. 17873); Klein Visch Rivier, *McOwan* s.n. (S. 19379); Uitenhage distr.: Uitenhage, *Zeyher* 103.4 (A, G, K, V, Z); Steenbokvlakte north of Winterhoeksberg, *Ecklon et Zeyher* (B, N, S). Queenstown distr.: Everett 39 (N). Barkly East distr.: Barkly East, II. 1934, *Greyvenstein* 8 (N). Albert distr.: Burghersdorp, *Cooper* 778 (D, K, Z); do., *Cooper* 1364 (BM, D, G, K, N, V, Z). Middelburg distr.: Middelburg, IV. 1922, *Gill* 44 (A, N, W); Rosmead Junction, III. 1911, *Pillans* 1804 (K). Philipstown distr.: Potfontein, III. 1933, *Schweickerdt* 1187 (N). Britstown distr.: Britstown, III. 1917, *Wilman* (B. 15149); 21 miles west of De Aar, X. 1928, *Pole Evans* 2230 (N). Prieska distr.: Prieska, IV. 1931, *Bryant* 606 (B, K, W); Spitzkop, III. 1920, *Bryant* K. 28 (N, W); Stofbakkies, III. 1934, *Wilman* 3131 (K, Mc). Herbert distr.: Campbell Kloof, II. 1937, *Wilman* s.n. (K); St. Clair, III. 1898, *Orpen* 254 (A, N); Honeynestkloof, III. 1920, *Wilman* s.n. (K); do., XI. 1929, *Phillips* 3469 (K, N) et 3468 (W). Kimberley distr.: Kimberley, II. 1913, *Wilman* 687 (Mc); do., VII. 1929, *Hitchcock* 24097 (K, W); Warrenton, IV. 1904, *Adams* 197 (T, V, Z); do., III. 1920, *Adams* s.n. (N). Mauritzfontein,



I. 1934, *Pocock* s.n. (U). Hay distr.: Wittewater, II. 1812, *Burchell* 2006 (G, K) et 2083 (A, B, K, P, V); Vaalwater, III. 1921, *Wilman* 1428 (K, Mc); Postmasburg, I. 1925, *Wilman* s.n. (U); near Griquatown, II. 1937, *Wilman* s.n. (K). Taungs distr.: Taungs, *Squire* H. 118 (N). Vryburg distr.: Vryburg, IV. 1912, *Sharpe* H. 7475 (N); do., III. 1920, *Theiler* H. 20239 (N); do., III. 1921, *Mogg* in Hb. Stell. 12541 (St). Without precise locality: *Carmichael* 51 (BM); *Burke et Zeyher* 1817 (O, P).

#### NATAL PROVINCE.

Estecourt distr.: Colenso, *Rehmann* 7182 (Z).

#### BASUTOLAND.

Leribe distr.: Leribe, *Dieterlen* 199 b (D, K, P pro parte, S); do., *Buchanan* 231 (S); Quthing distr.: Leloaleng, I. 1916, *Dieterlen* 1190 (N, P).

#### ORANGE FREE STATE.

Jacobsdal distr.: Jacobsdal, *Schweickerdt* 1151 (N). Fauresmith distr.: Fauresmith, XII. 1927, *Smith* 5178 (K) et I. 1928, *Smith* 5571 (K, N); Luckhoff, III. 1917, *Pole Evans* H. 11603 (N). Bloemfontein distr.: Bloemfontein, III. 1933, *Tidmarsh* 4931 (K) et 4933 (GU) et 4935 (GU). Senekal distr.: Senekal, XII. 1931, *Goossens* 942 (B, N). Kroonstad distr.: Kroonstad, II. 1928, *Pont* 9 (Z) et 58 (N, Z) et 60 (Z); do., III. 1931, *Guldenpfennig* 81 (N). Without precise locality: *Buchanan* 62 (D) et 66 (D) et 283 (BH, K) et 289 (D); *Rehmann* 3599 (Z).

#### TRANSVAAL PROVINCE.

Bloemhof distr.: Christiana, III. 1912, *Burt Davy* 14146 (N); do., I. 1934, *Theron* 563 (N). Potchefstroom distr.: Machavie, III. 1927, *Lane* 9 a (N) et 14 a (N). Johannesburg distr.: Johannesburg, IX. 1925, *Robinson* s.n. (N). Pretoria distr.: Pretoria, III. 1905, *Burt Davy* 185 (BH, K); do., III. 1929, *Skea* 63 (N); do., VI. 1912, *Theiler* 12022 (T); do., *Appleton* 42 (K). Rustenburg distr.: Rustenburg, II. 1933, *van Nieuwys* TM. 31894 (T). Marico distr.: Groot Marico, IV. 1927, *Liebenberg* S. 41 (N) et S. 45 (N). Waterberg distr.: Naboomspruit, III. 1923, *Galpin* M. 567 (N); Potgietersrust, IV. 1906, *Burt Davy* 2246 (N); do., III. 1921, *Galpin* 8892 (K, N). Pietersburg distr.: Pietersburg, IV. 1927, *Briggs* 10 (N); Duivelskloof, V. 1929, *Galpin* 11346 (N). Zoutpansberg distr.: Palmaryville, VI. 1930, *Koker* 10 (N); Messina, XII. 1917, *Moss et Rogers* 218 (Z). Barberton distr.: Barberton, V. 1930, *Thorncroft* 43 (N). Ermelo distr.: Nooitgedacht, I. 1927, *Henrici* 1473 (N).

#### BECHUANALAND PROTECTORATE.

Francistown, IV. 1929, *Gordon* 52 (N). Mochudi, V. 1914, *Harbor* s.n. (BH, D).

#### TYPE SPECIMEN.

*Ecklon* (et *Zeyher*) from Uitenhage is deposited in the Botanisches Museum, Berlin-Dahlem.

#### COMMON NAMES.

Bruine-gras. Steekgras. Stickgrass.

#### ECONOMIC NOTES.

This species, while young, is excellent for feeding cattle and sheep. In the mature state it is no longer palatable. The mature florets are very troublesome in wool and the awns often penetrate the skins of animals. The florets furthermore cause lameness in animals by penetrating the regions between their claws.

45. *A. submucronata* Schumach. in Sel. phys. og Mathem. Skr. **3**. 67 (1827); Henrard Crit. Rev. **3**. 609 (1928); Henrard Monogr. **2**. 321 cum ic. tab. 157 (1932).

*A. Thonningii* Trin. et Rupr. Spec. Gram. Stip. 137 (1842); Henrard Crit. Rev. **3**. 632 (1928).

*Annual*, tufted. *Culms* erect, or somewhat geniculately ascending, branched from near the base and the lower nodes, including the panicle up to 75 cm. high: internodes terete, striate, exserted: nodes rather swollen, glabrous. *Leaf-sheaths* tight and terete, at length fairly lax, keeled and slipping from the culms, striate, smooth to slightly scaberulous, shorter than the internodes; *ligule* a ciliate rim; auricles ciliate: collar glabrous; *blades* narrowly linear, up to 40 cm. long and 1–2 mm. wide, flat or involute, scaberulous on both surfaces, margins thickened. *Panicle* erect, subspiciform, interrupted; branches fairly shortly peduncled and subsessile, especially the upper, fascicled; pedicels fairly short. *Spikelets* greenish suffused with purple, yellowish at maturity, erect, congested. *Glumes* unequal, linear-lanceolate: the lower scabrous along the keel and more or less so on the flanks, up to 6 mm. long, gradually tapering into the short awn; the upper somewhat scabrous along the keel, bilobed with a short awn from the sinus, up to 7 mm. long. *Lemma* compressed, exceeding the glumes, about 9 mm. long, purple-mottled, scabrid along the keel upwards, or even scabrous in the upper half, punctulate; *callus* rounded, densely bearded, about 0.5 mm. long: awns subequal to unequal, very scabrous, winged, up to 15 mm. long.

#### SOUTH WEST AFRICA.

Grootfontein, II. 1933, *Schoenfelder* 74 (K, N); Waterberg, IV. 1928, *Bradfield* 377 (N); Omane, II. 1939, *Volk* 1148 (D); Gross Otavi, IV. 1939, *Volk* 581 b (D); Runtu, V. 1939, *Volk* 1714 (D); Kwartel near Rehoboth, IV. 1911, *Dinter* 2169 (B).

#### ORANGE FREE STATE.

Mudrivierdrift, *Rehmann* 3599 (B).

#### TRANSVAAL PROVINCE.

Pretoria distr.: Onderstepoort, II. 1936, *Mogg* 13797 (N).

#### BECHUANALAND PROTECTORATE.

Francistown, V. 1929, *Francis* 109 (N); Selika near Palapye, IV. 1928, *Nobbs* 97 (U); Mochudi, I. 1914, *Rogers* 6575 (A, G, K, N, W, WR, Z); do., III. 1915, *Rogers* 6598 (G).

#### TYPE SPECIMEN.

The type "*Guin. Dr. Thon. 356*" is deposited in the Schumacher Herbarium, Copenhagen.

#### ECONOMIC NOTES.

This species is only eaten in the pre-flowering condition by bovines.

46. *A. adscensionis* L. *subsp. guineënsis* (Trin. et Rupr.) Henrard Crit. Rev. **1**. 216 (1926); Henrard Monogr. **2**. 325 cum ic. tab. 159 (1932).

*A. adscensionis* Linn., sec. Obermeijer, Schweickerdt et Verdoorn in *Bothalia* **3**. II. 227 (1937), non Linn. *A. guineënsis* Trin. et Rupr. Spec. Gram. Stip. 137 (1842); Walp. Ann. Bot. **3**. 744 (1852); Steud. Syn. Pl. Glum. **1**. 139 (1854).

Plants placed under this subspecies superficially greatly resemble slender specimens of *A. curvata* (Nees) Trin. et Rupr., but may be distinguished from this species by the following characters: *Panicle* long and many-flowered, branches thin and spreading, naked at the base, the whole thus being lax and interrupted. The *glumes* and *lemmas* are usually shorter than those of typical *A. curvata* (Nees) Trin. et Rupr.

## TRANSVAAL PROVINCE.

Kruger National Park: Hippopool on Sabi River, III. 1937, *Obermeijer* TM. 36088 (K, T). Waterberg distr.: Crecy, *Carver* 8 (N). Zoutpansberg distr.: Zoutpan, IV. 1934, *Schweickerdt et Verdoorn* 472 (N); Messina, III. 1929, *Staples* 858 (K, N); do., III. 1933, *du Plessis* s.n. (K, N).

## TYPE SPECIMEN.

The type *Thonnig* s.n. is deposited in the Imperial Herbarium, Leningrad.

47. *A. barbicollis* Trin. et Rupr. Spec. Gram. Stip. 135 (1842); Walp. Ann. Bot. **3**. 746 (1852); Steud. Syn. Pl. Glum. **1**. 141 (1854); Dur. et Schinz, Consp. **5**. 800 (1894); Stapf in Dyer, Fl. Cap. **7**. 559 (1899); Medley-Wood, Natal Plants **5**. tab. 401 cum. descr. (1905); Stent in Bothalia **1**. IV. 278 (1924); Henrard Crit. Rev. **1**. 48 (1926); Henrard Monogr. **1**. 132 cum ic. tab. 50 (1929); Obermeijer, Schweickerdt et Verdoorn in Bothalia **3**. II. 227 (1937); Potts et Tidmarsh in Journ. S. Afr. Bot. **3**. III. 88 (1937).

*A. barbicollis* Trin. et Rupr. var. *conglomerata* Henr. Crit. Rev. Supplem. 705 (1933). *Chaetaria Forskohlii* Nees, Fl. Afr. Austr. 188 (1841), nor *A. Forskohlii* Tausch (1836).

*Perennial*, densely tufted, somewhat glaucous, with innovations usually present. *Culms* simple or branched from the lower nodes, several-noded, erect or geniculately ascending, slender, wiry, up to 60 cm. tall or somewhat taller; internodes distinctly compressed, glabrous or slightly scabrous; nodes glabrous exserted. *Leaf-sheaths* glabrous or somewhat scaberulous upwards, the lower strongly compressed and keeled, the upper less so, tight or at length slipping from the culms, shorter than the internodes; *ligule* a ciliolate rim; auricles glabrous or densely-long-bearded; collar bearded or glabrous; *blades* narrow linear, the apex rather obtuse, up to 20 cm. long but often much shorter, folded or convolute, curved or flexuous, the lower surface striate and glabrous, the upper scaberulous to hispidulous. *Panicle* composed of many peduncled spreading and divaricate false spikes, rather open, up to 15 cm. long and 5–10 cm. broad, variable in shape and size; axis erect, at length somewhat flexuous, angular, scaberulous; branches solitary or binate, distant, suberect or spreading, straight or flexuous, scaberulous, usually naked at the base for several centimetres; branchlets and pedicels congested to form false secondary spikes, scabrous. *Spikelets* usually brownish, often suffused with purple, congested. *Glumes* subhyaline, keeled, glabrous; the lower lanceolate, up to 6 mm. long, scaberulous on the keel and on the flanks near the apex, shortly awned; the upper linear, somewhat scaberulous on the keel and on the flanks upwards, shortly awned up to 8 mm. long. *Lemma* tubulous, glabrous below, distinctly scabrous upwards, including the callus and awns about 7–8 mm. long; *callus* 1 mm. long, densely bearded; *colum* of awns about 2.5 mm. long, twisted, scaberulous; awns subequal, spreading, fine, scaberulous, about 1.5–2 cm. long.

## SOUTH WEST AFRICA.

Okahandja, V. 1928, *Bradfield* 277 a (N).

## CAPE PROVINCE.

Prince Albert distr.: Weltevreden, *Drège* (K). Graaff-Reinet distr.: Sundays River, *Drège* [3879] (B, K, N, O, P, S); Graaff-Reinet, *Bolus* 677 (A, BH, D, K, V) et 679 (A, BM). Somerset East distr.: Somerset East, *McOwan* 1789 (BM, S) et 1657 (S). Uitenhage distr.: Between Koega and Sunday River, *Ecklon et Zeyher* 76 (N, S) et *Ecklon* s.n. (K); Enon, *Drège* 3881 (B, O); Albany distr.: Grahamstown, II. 1904, *Black* 23 (B, T); Botha's Hill, XII. 1894, *Schlechter* 6097 (A, B, BM, G, K); do., XII. 1926, *Britten* 5513 (A); do., V. 1928, *Dyer* 1439 (A, K, N); Carlisle Bridge, V. 1921, *Bowker* 6 (A); Peddie Road, IV. 1928, *Dyer* 1365 (A, K). Bathurst distr.: Kowie; *Hutton* 5 (A). Fort Beaufort distr.: Between Kunap and Kat Rivers, *Drège* 3881 (B), Adelaide, *Marloth* 3683 (B, N); Koonap Heights, IV. 1920, *Britten* 2041 (A). East London distr.: Nahoon Causeway, *Rattray* 1361 (N). Komgha distr.: Komgha, *Flanagan* 100,



(N) et 1010 (BH, S) : Kei Bridge, III. 1909, *Rogers* 4513 (A). Kentani distr. : Kentani, III. 1909, *Pegler* 238 (BH). Queenstown distr. : Queenstown, *Everett* 49 (N); Shiloh, *Baur* 55 (N); Sterkstroom, II. 1917, *Burt Davy* 17059 (BH); Klaas Smits R. Bridge, III. 1928, *Galpin* 2355 (K, N). Xalanga distr. : Tsomo River, *Pegler* 1708 (BH). Wodehouse distr. : Sterkstroom, XI. 1901, *Sim* 2810 (A). Qumbu distr. : Tsitsa River, I. 1895, *Schlechter* 6374 (A, B, BH, BM, G, K, P, V). Colesberg distr. : Colesberg, *Drège* (K). Herbert distr. : Campbell, III. 1920, *Pole Evans* 11 (K). Prieska distr. : Prieska, III. 1931, *Bryant* 605 (K). Kimberley distr. : Kimberley, VII. 1929, *Hitchcock* 24099 (K, N, W); Rooipoort, III. 1923, *Wilman* 2222 (K, Mc); Kareeboom, III. 1921, *Wilman* 1425 (K, Mc, U); Du Toitspan, *Tuck* s.n. (K); near Vaalrivier, IV. 1886, *Schenck* 794 (N, Z). Kuruman distr. : III. 1931, *Lawson* 15031 (BH).

#### NATAL PROVINCE.

Umzinto distr. : Dumisa, I. 1915, *Rudatis* 2190 (St.) Ixopo distr. : Ixopo, III. 1935, *Otto* 1 a (N). Pietermaritzburg distr. : Pietermaritzburg, XI. 1930, *Goossens* 153 (N, W) et II. 1934, *Howes* 9 (K, W). Estcourt distr. : Winterton, I. 1933, *King* 386 (N); Colenso, II. 1891, *Medley Wood* 4418 (D, K); do., III. 1894, *Kuntze* s.n. (B). Helpmakaar distr. : Umsinga, *Buchanan* 90 (K). Bergville distr. : Acton Homes, I. 1920, *Doidge* H. 19837 (N) et H. 19839 (N). Zululand : XII. 1898, *Jenkinson* 40 (D, N). Without precise locality : *Gerrard et McKen* 167 (D); *Buchanan* 290 (B, D, K); *Medley Wood* 3588 (D, K).

#### BASUTOLAND.

Quthing distr. : Leloaleng, I. 1916, *Dieterlen* 1191 (N, P, S) et 1193 (N, P, S). Leribe distr. : Leribe, *Buchanan* 148 (BH).

#### ORANGE FREE STATE.

Fauresmith distr. : Fauresmith, I. 1928, *Smith* 5240 a (K) et 5503 (K) et 5572 (N). Bloemfontein distr. : Bloemfontein, II. 1934, *Tidmarsh* 4934 (GU) et II. 1915, *Potts* 1904 (T). Boshof distr. : Neth-el-Pella, IV. 1931, *Wolff* 11 (N). Hoopstad distr. : Hoopstad, II. 1933, *Goossens* 1277 (N); Great Vetrivier, *Burke* 210 (K, S) et *Burke et Zeyher* 1816 (O, P, V) et *Zeyher* 1816 (BM, S). Without precise locality : *Buchanan* 57 (D, K).

#### TRANSVAAL PROVINCE.

Bloemhof distr. : Christiana, III. 1912, *Burt Davy* 13031 et 13105 et 14102 et 14143 (omnes N) et II. 1904, *Burt Davy* 1609 (N). Potchefstroom distr. : Potchefstroom, XI. 1927, *Liebenberg* 1067 (N). Johannesburg distr. : Johannesburg, III. 1924, *Moss* 9840 (WR); do., VII. 1929, *Hitchcock* 24102 (K, N, W) et 24134 (K, W). Pretoria distr. : Pretoria, III. 1920, *Burt Davy* 18811 (K); do., *Smith* 81 (N) et 2288 (N); do., XI. 1934, *Liebenberg* 3210 (N); do., *Appleton* 22 (B, K); do., *Leendertz* 1095 (T); do., X. 1929, *Sandwith* 94 (K) et 95 (K); Premier Mine, II. 1924, *Rogers* 25323 (St); Hartebeestpoort, XI. 1925, *Moss* 12014 (K, WR); Baviaanspoort, IV. 1927, *Moss* 14161 (WR). Rustenburg distr. : I. 1909, *Collins* 6865 (T). Waterberg distr. : Warmbaths, I. 1936, *Irvine* 23 (N); Naboomspruit; II. 1919, *Galpin* M. 422 (N, W) Pongola River, XII. 1919, *Burt Davy* 18265 (K). Pietersburg distr. : Pietersburg, IV. 1927, *Briggs* 11 (N); do., II. 1904, *Bolus* 10901 (A, BH, K, N); Daviesville, II. 1932, *Markötter* in Hb. *Stell.* 16277 (St); Tzaneen, XI. 1913, *Rogers* 12511 (A, BH, K, N, W); The Downs, XI. 1917, *Moss et Rogers* 447 (K) et II. 1919, *Junod* 4078 (N, T); Modjadjes, XII. 1915, *Rogers* 18055 (BH). Zoutpansberg distr. : Mara, I. 1929, *Archer* 16 (N); Zoutpan, IV. 1934, *Schweickerdt et Verdoorn* 461 (N); Messina, X. 1929, *Turner* 20 (N); Pafuri River, *Nelson* 54 x (T). Lydenburg distr. : Lydenburg, XII. 1873, *Atherstone* s.n. (A); do., XII. 1893, *Schlechter* 3961 (A, B, BH, BM, G, K, P). Barberton distr. : Nelspruit, XII. 1930, *Liebenberg* 2733 (N); Barberton, I. 1931, *Mattheus* 15 (N); Kaapmuiden, XII. 1921, *Rogers* 25083 (T). Swaziland : Black Umbuluzi, V. 1932, *Pole Evans* 3446 (B, K, N, W).

## BECHUANALAND PROTECTORATE.

Gaberones, III. 1930, *Van Son* TM. 28609 (BM, N, T); do., IV. 1928, *Nobbs* 6 (U). Mochudi, III. 1914, *Rogers* 6578 pro parte (K). Mahalapye, IV. 1931, *Pole Evans* 3206 (N). Francistown, IV. 1929, *Gordon* 90 (N) et 105 (N).

## PORTUGUESE EAST AFRICA.

Lourenco Marques, IX. 1919, *Shantz* 336 (K, W); do., XII. 1897, *Schlechter* 11569 (A, B, BH, N).

## TYPE SPECIMEN.

*Drège* 3881 is deposited in the Botanisches Museum, Berlin-Dahlem.

## COMMON NAMES.

Duin-steekgras. Los-steekgras.

## ECONOMIC NOTES.

This species is abundant in disturbed areas. In the young condition it is eaten by cattle and game, but in the more mature condition it forms indifferent grazing. On the whole it is not considered to be of much value as a fodder grass. It stands drought well. In the mature condition it is a pest to sheep farmers and thus is a troublesome weed. The natives use the culms for making brushes.

## REMARKS.

This species in its typical form may readily be distinguished from *A. congesta* Roem. et Schult. by the open inflorescence. There are, however, very many intermediates which link up the two species, and such specimens can only be named arbitrarily. It is very probable that much natural hybridisation occurs among these species, since they frequently grow in association and also flower during the same period.

48. *A. alopecuroides* Hack. in Verh. Bot. Ver. Prov. Brandenb. **30**. 114 (1888); Dur. et Schinz, *Consp.* **5**. 800 (1894); Hack. in Bull. Herb. Boiss. **4**. Append. III. 17 (1896); Garabedian in Ann. S. Afr. Mus. **16**. II. 400 (1925); Henrard Crit. Rev. **1**. 22 (1926); Henrard Monogr. **1**. 121 cum ic. tab. 43 (1929).

Robust caespitose perennial. Culms erect, simple, up to 90 cm. high, 3-4-noded; internodes somewhat compressed, glabrous, smooth and striate; nodes exserted. Leaf-sheaths glabrous, smooth or slightly scaberulous, striate, compressed, tight; ligule a densely ciliolate rim; auricles pubescent or bearded; collar pubescent or bearded; blades linear, acuminate, up to 20 cm. long and 3 mm. wide, flat at the base, convolute upwards, glabrous and smooth beneath, scabrous and hirtellous on the upper surface. Panicle exserted, contracted, linear, elongate, spike-like, dense, up to 20 cm. long and 3 cm. broad, interrupted only at the very base; axis terete, scaberulous below; branches solitary, much-branched from near the base; branchlets and pedicels scabrous, short, fascicled, axils pubescent or glabrous. Spikelets erect, linear, scaberulous, congested. Glumes subequal; the lower very scabrous on the keel, including the 4 mm. long awn about 9-10 mm. long; the upper scabrous on the keel upwards, up to 12 mm. long including the 3 mm. long awn, apex bifid. Lemma about 6 mm. long, tubulous, narrowed into the column, granular and finally densely tubercled upwards; callus 1 mm. long, acute, densely hairy; column 4-6 mm. long, twisted, scabrous; awns subequal, 20-25 mm. long, scabrous, spreading.

## SOUTH WEST AFRICA.

Olukonda, I. 1886, *Schinz* 656 (K, N, V, Z).

## TYPE SPECIMEN.

*Schinz* 656 is deposited in the Naturhistorisches Museum, Vienna.

49. **A. Pilgeri** *Henrard Crit. Rev.* **2.** 443 (1927); *Henrard Monogr.* **1.** 123 cum ic. tab. 45 (1929).

Robust caespitose *perennial*. Culms erect, including the inflorescence up to 150 cm. high, simple, glabrous, glaucous, striate, terete, 3–6-noded; internodes exserted; nodes glabrous. *Leaf-sheaths* shorter than the internodes, usually pallid, margins finely ciliolate; *ligule* minutely ciliolate; auricles glabrous or bearded; collar glabrous or bearded with reflexed hairs; *blades* from a flat base, gradually acuminate, laxly convolute upwards, upper leaves involute, up to 35 cm. long, fairly rigid, glabrous on the lower surface, scabrous on the upper surface and along the margins, finely but not prominently nerved. *Panicle* dense, more or less contracted, at times subspicate, up to 40 cm. long and 5 cm. wide; axis terete or subangular, striate; branches solitary, up to 11 cm. long, erect or almost adpressed, much-branched from the base; branchlets adpressed. *Spikelets* densely imbricate, shortly pedicelled, pallid. *Glumes* somewhat unequal, awned; the lower 7.5–9 mm. long including the 1.5–2 mm. long awn, scaberulous in the upper half, keel and nerves scabrous, abruptly narrowed into the short awn; the upper 10–12 mm. long including the 2 mm. long awn, linear-lanceolate, keel smooth, bidentate at the apex. *Lemma* 6–7 mm. long including the column, linear or subfusiform, finely punctulate, finely scaberulous towards the apex; *callus* 0.75–1 mm. long, subobtusate, bearded; column of the awns about 1.5 mm. long, scaberulous, twisted; awns almost equal, somewhat spreading, scabrous, 10–20 mm. long.

#### SOUTH WEST AFRICA.

Omaheke, IV. 1911, *Seiner* 473 (B, W); Grootfontein, IV. 1916, *Hörnig* 165 (B, N); Otjiwarongo, III. 1928, *Bradfield* 278 (K, N); Okahandja, *Dinter* 1523 (B); Otjitjika, IV. 1913, *Dinter* 2938 (B, L, N); Eahero, III. 1913, *Dinter* 3281 (B); Namutoni-Tsinabis, VIII. 1919, *Pole Evans* 19380 (K, N); Asispforte, anno 1939, *Volk A.* 2 (D); Ossa, III. 1939, *Volk* 1831 (D); Neitsas, IV. 1939, *Volk* 380 (D); Blochfontein, V. 1939, *Volk* 1696 (D); Andara, V. 1939, *Volk* 2156 (D); Hollywood, II. 1939, *Volk* 1277 (D).

#### BECHUANALAND PROTECTORATE.

Raukaboom's Well, IV. 1931, *Pole Evans* 3309 (K, N).

#### TRANSVAAL PROVINCE.

Pretoria distr.: Aapies River Station, IV. 1939, *de Wit*, 794 (D).

#### NORTHERN RHODESIA.

Near Namwala, VII. 1932, *Trapnell* 1115 (K).

#### TYPE SPECIMEN.

*Dinter* 2938 is deposited in the Rijksherbarium, Leiden.

#### ECONOMIC NOTES.

Several collectors state this species to be of little or no value as a fodder plant as it is too tough and hard.

50. **A. longicauda** *Hack.* in *Boll. Soc. Brot.* **6.** 143 (1888); *Dur. et Schinz, Consp.* **5.** 804 (1894); *Henrard Crit. Rev.* **2.** 305 (1927); *Henrard Monogr.* **1.** 122 cum ic. tab. 44 (1929).

*Perennial*, caespitose, with several innovations. Culms erect, simple or somewhat branched from the upper nodes, up to 80 cm. high; internodes more or less terete or slightly compressed, glabrous and smooth; nodes glabrous, exserted. *Leaf-sheaths* shorter than the internodes, terete or somewhat keeled upwards, glabrous, striate; *ligule* a short ciliolate rim; auricles long-bearded but hairs deciduous; collar bearded or glabrous; *blades* convolute, filiform, up to 30 cm. long and 2 mm. wide, glabrous and striate on the lower surface,



scaberulous on the upper surface. *Panicle* long-exserted, densely spike-like, contracted, up to 20 cm. long but often very much shorter, somewhat interrupted at the base; branches solitary, scaberulous, the lower naked at the base, the upper almost sessile, much-branched, adpressed; branchlets and pedicels short, scaberulous, densely fascicled. *Spikelets* congested, shortly pedicelled or subsessile, greenish or tinged with purple. *Glumes* unequal, shortly awned; the lower about 4.5 mm. long, scaberulous on the keel and on the flanks upwards, awn about 2 mm. long; the upper about 6 mm. long, keel glabrous, flanks very minutely strigose upwards, awn about 3 mm. long. *Lemma* tubulose, narrowed into the column, finely granular and somewhat scaberulous dorsally upwards, about 5-6 mm. long including the 1.5 mm. long densely bearded acute *callus*; column about 5 mm. long, twisted, scaberulous; awns fine, spreading, scaberulous, subequal, up to 2.5 cm. long.

#### TRANSVAAL PROVINCE.

Barberton distr.: Komatipoort, XI. 1917, *Moss et Rogers* 608 (D, WR).

#### PORTUGUESE EAST AFRICA.

Lourenco Marques, X. 1919, *Shantz* 338 (K, W); do., IV. 1927, *Vaughan* s.n. (K); Mocimboa, *Carvalho* 35 (N, V).

#### TYPE SPECIMEN.

*Carvalho* 35 is deposited in the Naturhistorisches Museum, Wien.

51. *A. congesta* Roem. et Schult., Syst. Veg. **2**. 401 (1817); Kunth, Enum. **1**. 195 (1833); Trin. et Rupr. Spec. Gram. Stip. 153 (1842); Walp. Ann. Bot. **3**. 746 (1852); Steud. Syn. Pl. Glum. **1**. 142 (1854); Dur. et Schinz, Consp. **5**. 802 (1894); Hack. in Bull. Herb. Boiss. **4**. Append. III. 18 (1896); Stapf in Dyer, Fl. Cap. **7**. 558 (1899); Medley-Wood, Natal Plants **5**. tab. 484 cum descr. (1908); Marloth, Fl. S. Afr. **4**. 21 tab. 6 fig. F 1-4 (1915); Phillips in Ann. S. Afr. Mus. **16**. 347 (1917); Dinter in Fedde, Rep. **15**. 341 (1918) pro parte; Stent in Bothalia **1**. IV. 277 (1924); Garabedian in Ann. S. Afr. Mus. **16**. II. 401 (1925); Henrard Crit. Rev. **1**. 113 (1926); Henrard Monogr. **1**. 126 cum ic. tab. 47 (1929); Range in Fedde, Rep. **33**. 8 (1933); Mogg in S.A. Journ. Science **31**. 394 (1934); Potts et Tidmarsh in Journ. S. Afr. Bot. **3**. III. 88 (1937).

*A. barbicollis* Trin. et Rupr. sec. Range in Fedde, Rep. **33**. 8 (1933), non Trin. et Rupr. *A. adscensionis* L. sec. F. Bolus in Ann. S. Afr. Mus. **9**. IV. 231 (1915) pro parte, non Linn. *A. coarctata* Licht. ex Roem. et Schult., Syst. Veg. **2**. 401 (1817) in syn., non H. B. K.; Henrard Crit. Rev. **3**. 699 (1928). *A. congesta* Roem. et Schult. var. *genuina* Chiov., Fl. Eritr. 383 (1899); Henrard Crit. Rev. **1**. 115 (1926). *A. Rangei* Pilger in Engl. Bot. Jahrb. **48**. 344 (1912); Dinter in Fedde, Rep. **15**. 342 (1918); Garabedian in Ann. S. Afr. Mus. **16**. II. 404 (1925); Henrard Crit. Rev. **3**. 498 (1928); Henrard Monogr. **1**. 121 cum ic. tab. 44 (1929); Range in Fedde, Rep. **33**. 9 (1933). *Chaetaria congesta* (Roem. et Schult.) Nees, Fl. Afr. Austr. 189 (1841).

*Perennial*, densely tufted, somewhat glaucous, with a few innovations nearly always present, at times a dwarf annual. *Culms* simple or branched from the lower nodes, wiry, slender, erect or somewhat geniculately ascending, several-noded, up to 75 cm. high, but frequently much smaller; internodes usually somewhat compressed especially below, glabrous, exserted; nodes glabrous. *Leaf-sheaths* compressed, striate, glabrous or slightly scaberulous towards the ligule, the lower pallid and strongly keeled, the upper at times somewhat keeled; *ligule* a ciliolate rim; auricles glabrous or densely long-bearded; collar glabrous or minutely pubescent; *blades* linear, terminating in a subobtuse tip, up to 20 cm. long, folded or convolute, usually somewhat curved or flexuous, glabrous and striate on the lower surface, scaberulous on the upper surface. *Panicle* dense, spike-like but frequently interrupted at the base by 1-several shortly peduncled spreading or adpressed false spikes, up to 15 cm. long, finally well-exserted; axis subterete to angular; branches short, almost sessile, scaberulous, branched from the base; pedicels scaberulous, angular, very short. *Spikelets* pallid or somewhat greenish-purple, densely congested. *Glumes* unequal, subhyaline; the lower lanceolate, scaberulous on the keel, often minutely so on the flanks

upwards, up to 8 mm. long, passing into the 1 mm. long scaberulous awn; the upper up to 10 mm. long, glabrous, scaberulous on the keel upwards, passing into the short awn. *Lemna* tubulous, up to 10 mm. long including the callus and the column, distinctly scabrous upwards; *callus* 1 mm. long, densely bearded; column of awns up to 5 mm. long, twisted; awns somewhat unequal, spreading, fine, scabrous, up to 20 mm. long or somewhat longer.

#### SOUTH WEST AFRICA.

Otjiwarongo, I. 1939, *Volk* 472 (D); do., I. 1939, *Volk* 843 (D); Omane, II. 1939, *Volk* 1144 (D); Ossa, IV. 1939, *Volk* 1541 (D); between Tsumeb and Nosib, IV. 1934, *Dinter* 7444 A (B, G, N); Grootfontein, IV. 1913, *Engler* 6230 (K); Waterberg, V. 1928, *Bradfield* 277 b. (N); between Hoffnungsfelde and Harris, I. 1916, *Pearson* 9542 (BH, K, S); between Haris and Aub, I. 1916, *Pearson* 9669 (BH, S); Okahandja, III. 1928, *Bradfield* 277 (N, T); Klein Karas, V. 1931, *Oertendahl* 236 (B); do., IV. 1931, *Oertendahl* 116 (N); Kuibis, V. 1909, *Range* 647 (B, N); Aris, *Range* 1270 (K, N); Kubub, II. 1885, *Schinz* 657 (Z); Warmbad, IV. 1890, *Wandres* 19 (Z); without precise locality: *Grossarth* 42 (B) et *Blank* 39 (B).

#### CAPE PROVINCE.

Gordonia distr.: Upington, IX. 1919, *Shantz* 185 (W) et 182 (W); do., IV. 1928, *Pole Evans* 2173 (N). Kenhart distr.: Louisvale, II. 1930, *Mennell* s.n. (W). Little Namaqualand distr.: Springbokkuil, *Zeyher* 1818 (G, K, S, V); Dabeep, I. 1911, *Pearson* 6226 (K); Pella, I. 1909, *Pearson* 3590 (K). Fraserburg distr.: Williston, XI. 1921, *Foley* 187 (N). Cape distr.: Houtbay, VI. 1892, *Schlechter* 1015 (A, B, BH, V, Z). Prince Albert distr.: Fraserburg Road, I. 1903, *Marloth* 3054 (N). Uitenhage distr.: Steenbokvlakte, *Ecklon* (et *Zeyher*) s.n. (A, B, N, S); Uitenhage, IV. 1893, *Schlechter* 2458 (A, BH, BM, G, K, Z); Brakkloof, III. 1901, *White* 3 (A, B, V); Kariega, I. 1904, *White* 108 (A). Somerset East distr.: Somerset East, VIII. 1871, *McOwan* 1788 (A, BM, S); do., *Bowker* 134 (K) et 148 (K). Queenstown distr.: Shiloh, *Baur* 55 (K). Klaas Smit's Bridge, III. 1928, *Galpin* 2355 (A). East London distr.: East London, III. 1917, *Wood* TM. 23228 (T). Komgha distr.: Along Kei River, III. 1894, *Flanagan* 2317 (A, BH, K, N). Xalanga distr.: Cala, *Pegler* 1708 (K). Wodehouse distr.: Indwe, *Baur* 71 (K). Aliwal North distr.: Aliwal North, *Stephanie* 15080 (BH). Albert distr.: *Cooper* 778 pro parte (K, N). Cradock distr.: Cradock, IX. 1919, *Shantz* 151 (W). Graaff-Reinet distr.: Graaff-Reinet, XI. 1866, *Bolus* 550 (A); do., III. 1868, *Bolus* 679 (BH, D, K, V); do., III. 1930, *Galpin* 10588 (N). Middelburg distr.: Middelburg, IV. 1922, *Gill* 43 (A, N, W). Victoria West distr.: Nobelsfontein, II. 1931, *Thorne SAM*. 49454 (S). Colesberg distr.: Colesberg, *Drège* 4349 (B, BM, G, K, V); do., *Shaw* 16 (K, V). Philipstown distr.: Potfontein, III. 1933, *Schweickerdt* 1204 (N); Petrusville, II. 1934, *du Plessis* in Hb. Stell. 19713 (St). Britstown distr.: Giesen's Kraal, III. 1917, *Wilman* s.n. (BH). Prieska distr.: Between Modderfontein and Keikam's Poort, IX. 1811, *Burchell* 1612-5 (K); Prieska, III. 1931, *Bryant* 605 (B, K, W). Hay distr.: Between Griquatown and Wittewater, II. 1812, *Burchell* 1983 (K); between Kloof Village and Wittewater, *Burchell* 2084 (K); near Postmasburg, VI. 1929, *Uys* G. 18 (N). Herbert distr.: Douglas, III. 1898, *Orpen* 254 (K). Kimberley distr.: Modderriver, II. 1894, *Kuntze* s.n. (B, K); Kimberley, *Rehmann* 3472 (B) et 3475 (B); do., *Moran* BH. 13910 (BH); do., IV. 1914, *Wilman* 688 (Mc); do., VII. 1919, *Shantz* 198 (K, W). Barkly West distr.: Waldeck's Plant, V. 1936, *Cooke* 3533 (Mc); Madipelessa, II. 1937, *Acock* 1825 (B, K, L, V, Z). Vryburg distr.: Armoedsvlakte, *Theiler* H. 19218 (N) et H. 20195 (N); Vryburg, I. 1923, *Kaplan* TM. 26077 (T). Mafeking distr.: Mafeking, X. 1919, *Shantz* 233 (K, W) et 236 (K, W); do., IV. 1929, *Pole Evans* 3061 (N). Kuruman distr.: Kuruman, II. 1886, *Marloth* 996 (B, W); do., III. 1928, *Pole Evans* 2063 (B, BM, N); do., I. 1929, *Dedman* in Hb. Stell. 10054 (St). Without precise locality: *Lichtenstein* (B); *Shantz* 209 (K, W).

#### NATAL PROVINCE.

Estcourt distr.: Winterton, I. 1933, *King* 389 (N). Dundee distr.: VII. 1899, *Green* 39 (D). Without precise locality: *Buchanan* 124 (K).

## BASUTOLAND.

Mafeteng distr.: Likhoele, XI. 1914, *Dieterlen* 1069 (N, P). Leribe distr.: Leribe, *Buchanan* 149 (K); do., *Dieterlen* 383 (B, D, K, N, P, W); do., *Phillips* 655 (S) et 898 (K, S); Maluti mountains, XII. 1937, *Staples* 142 (N).

## ORANGE FREE STATE.

Fauresmith distr.: Fauresmith, V. 1927, *Smith* 3984 (K) et I. 1928, *Smith* 5241 (K). Edenburg distr.: Trompsburg, *Potts* 4539 (GU, N). Bloemfontein distr.: Besters, XII. 1911, *Burt Davy* 11789 (N); Bloemfontein, II. 1915, *Potts* 1904 (D, K); do., XII. 1933, *Tidmarsh* 4923-4925 (K); do., *Snoek* 4927 (GU) et 4928 (GU); Brandfort, XII. 1934, *Schonken* in Hb. Stell. 23305 (St). Boshof distr.: Beth-el-Pella, *Wolff* 10 (N). Winburg distr.: Steynskloof, II. 1928, *de Wet* 4570 (GU). Ficksburg distr.: Rivenhill Farm, I. 1927, *Potts* 3676 (N, GU) et 3724 (N, GU). Fouriesburg, *Dixon* 4591 (GU). Senekal distr.: Doornkop, XII. 1931, *Goossens* 870 (N, K, W) et 933 (N, K, W). Ferrara, XII. 1931, *Goossens* 1004 (K, N). Bethlehem distr.: Bethlehem, X. 1901, *Richardson* (K, W). Hoopstad distr.: Wesselsbron, I. 1933, *Goossens* 1249 (N). Kroonstad distr.: Kroonstad, XI. 1928, *Pont* 96 (N) et 97 (GU); do., XII. 1933, *Laubscher* 4926 (GU); Bothaville, I. 1933, *Goossens* 1174 (B, N) et 1178 (N); do., IV. 1931, *Boshoff* 2 (N); do., III. 1933, *Schweickerdt* 1088 (N). Vredefort distr.: Viljoensdrift, I. 1912, *Rogers* 4819 (T). Heilbron distr.: Heilbron, I. 1934, *Goossens* 425 (N). Without precise locality: *Buchanan* 58 (B) et 59 (B) et 276 (B); *Rehmann* 3668 (A, Z).

## TRANSVAAL PROVINCE.

Bloemhof distr.: Christiana, II. 1904, *Burt Davy* 1654 (N); Kameelpan, I. 1934, *Theron* 549 (N); Fourteen Streams, II. 1904, *Burt Davy* 1577 (N). Wolmaransstad, XII. 1928, *Sutton* 69 (N). Lichtenburg distr.: Grasfontein, V. 1930, *Sutton* 425 (N). Potchefstroom distr.: Potchefstroom, II. 1927, *Lane* 15 (N, W) et 17 (N). Vereeniging distr.: Vereeniging, II. 1917, *Burt Davy* 17162 (BH, K). Standerton distr.: Standerton, III. 1918, *Stent* H. 21833 (N). Ermelo distr.: Ermelo, XII. 1926, *Henrici* 1361 (N, W); do., II. 1936, *Norval* 136 (N); Lake Chrissie, IV. 1910, *Hamilton* H. 5914 (N). Barberton distr.: Barberton, XII. 1916, *Pott* 5527 (T); do., I. 1931, *Matthews* 8 (N). Middelburg distr.: Middelburg, III. 1910, *Hewitt* s.n. (T). Johannesburg distr.: Johannesburg, V. 1919, *Bryant* D. 47 (N, W); do., XII. 1908, *Leendertz* 1837 (T); do., III. 1919, *Moss* 3810 (W, WR); do., I. 1915, *Edwards* s.n. (A, BH, K); do., III. 1937, *Lintner* 28130 (D, K); do., VII. 1929, *Hitchcock* 24102 (S). Germiston distr.: Germiston, I. 1913, *Fenn* H. 8703 (N). Pretoria distr.: Pretoria, *Nelson* 64 (K); do., III. 1920, *Skea* 68 (N); do., I. 1930, *Obermeijer* 29140 (T); do., I. 1926, *Smith* 2285 (N); Premier Mine, II. 1921, *Menzies* 6 (N); Elandsrivier, *Rehmann* 4999 (B, K); Pienaars River, I. 1894, *Schlechter* 4140 (A, B, BH, BM, G, K, N, P, T, V, Z). Rustenburg distr.: Rustenburg, III. 1910, *Burt Davy* 9302 (N). Waterberg distr.: Warmbaths, I. 1936, *Irvine* 19 (N) et 19 a (N); Twenty-four Rivers, I. 1916, *Rogers* 24908 (WR); Naboomspruit, II. 1919, *Galpin* M. 421 (N); Potgietersrust, I. 1909, *Leendertz* 1990 (T); Crecy, *Carver* 11 (N). Pietersburg distr.: Shilouvane, *Junod* 2155 (G). Zoutpansberg distr.: Zoutpansberg, V. 1905, *Junod* H. 4662 (N). Lydenburg distr.: Lydenburg, *Atherstone* s.n. (A, K, S); do., XII. 1893, *Schlechter* 3961 (BM, T); Zwagershoek, I. 1930, *Obermeijer* 377 (T).

## BECHUANALAND PROTECTORATE.

Gaberones, IV. 1928, *Nobbs* 11 (U); Metsematluko, IV. 1928, *Nobbs* 34 (U); Mochudi, V. 1914, *Harbor* 21789 (BH).

## PORTUGUESE EAST AFRICA.

Lourenco Marques, VII. 1922, *Moss* 6906 (WR).

## TYPE SPECIMEN.

There are four sheets collected by *Lichtenstein* which are deposited in the Botanisches Museum, Berlin-Dahlem. The original labels on the sheets say "*Aristida coarctata*".



The specimens are overmature. There is another sheet in the Willdenow Herbarium, Berlin, which is an excellent match of Lichtenstein's gatherings. Although this sheet does not state the collector, it bears the name "*A. coarctata* Licht." and from its perfect match I do not hesitate to say that it is part of the original gathering. This sheet has been named up by Henrard as *A. congesta* Roem. et Schult.

The above-mentioned five sheets undoubtedly represent the type gathering, and the part of this in the Willd. Herbarium has actually been studied by Henrard.

#### COMMON NAMES.

Buffalo grass. Duin-steekgras. Klossaad. Rotstert-steekgras. Steekgras.

#### ECONOMIC NOTES.

This species is considered to be poor grazing, but quite a good hay if it is cut early. When mature it is a pest to the sheep farmer and is supposed to have no fodder value to speak of. It is, however, an important annual in overgrazed and tramped-out areas. In the wilted condition this species has been found to contain large amounts of prussic acid.

#### REMARKS.

Examination of Lichtenstein's gatherings and the type of *A. barbicollis* has revealed the fact that the auricles of the leaves are bearded. Owing to the overmature condition of the Lichtenstein specimens most of the hairs have disappeared, and it is only on some leaves that the beards are still present. Stapf in Dyer, Fl. Cap. 7. 552 (1899) has used the presence or absence of the bearded auricles as a key-character to distinguish between *A. barbicollis* and *A. congesta*. Although some specimens actually have glabrous auricles, this character does not appear to be coupled with the contracted inflorescence. I have seen several specimens with open panicles typical of *A. barbicollis* in which the auricles are perfectly glabrous. This distinguishing character must thus be discarded as it is of no taxonomic value. In my opinion the shape of the panicle, viz., contracted, or lax and open, appears to be the only character upon which the two species in question may be distinguished. There are, however, many intermediates which can only be named arbitrarily. Having furthermore examined a fair number of "dwarfed specimens" I have come to the conclusion that *A. Rangei* is most probably nothing else but a first year flowering condition of *A. congesta*. Field study and breeding experiments will probably support the opinion expressed above.

52. *A. spectabilis* Hack. in Bull. Herb. Boiss. 3. VIII. 380 (1895); Stapf in Dyer, Fl. Cap. 7. 562 (1899); Stent in Bothalia 1. IV. 278 (1924); Henrard Crit. Rev. 3. 577 (1928); Henrard Monogr. 1. 93 cum ic. tab. 25 (1929); Theron in Fedde, Rep. 40. 26 (1936).

Densely caespitose rather robust *perennial*. Culms erect, stout, up to 1.5 m. high, simple, terete, sheathed nearly all along. Sheaths exceeding the internodes, glabrous, smooth, often with a flake of wool at the mouth and from there somewhat woolly along the margins downwards, the upper inconspicuously striate; auricles of lowermost sheaths usually bearded, those of the uppermost sheaths usually glabrous. Leaf-blades linear, involute, firm, tapering to a setaceous apex, smooth on the lower surface, prominently nerved and minutely scaberulous on the upper surface, up to 60 cm. long, 4-5 mm. wide at the base, somewhat glaucous. Panicle oblong to ovate, lax and open, nodding, 30-40 cm. long, the axis smooth, with distant binate or solitary branches up to 20 cm. long, which in turn are again branched from near their base, the secondary, tertiary, etc., branchlets and pedicels minutely scaberulous, the latter as long as or much longer than the glumes. Spikelets glabrous, yellowish or greenish. Glumes linear-lanceolate, acute, rather firm, with hyaline erosely dentate tips and narrow margins, 1-nerved, smooth, subequal, about 10-12 mm. long. Lemma linear, about 6.5-7.5 mm. long inclusive of the callus, smooth or dorsally

minutely scaberulous upwards. *Callus* up to 1 mm. long, densely bearded, bifid. Column of awns strongly twisted, nearly glabrous, 5–6 mm. long; awns scaberulous, erect or spreading, unequal, the central up to 44 mm. long, the lateral awns up to 28 mm. long. *Anthems* 5 mm. long.

#### TRANSVAAL PROVINCE.

Potchefstroom distr.: Oudeplaats, IV. 1937, *Bunting* 156 (N) et 161 (N). Krugersdorp distr.: Hekpoort, III. 1937, *Bunting* 126 (N) et 145 (N). Pretoria distr.: Kuduspoort, *Rehmann* 4695 (B, V, Z): Saartjesnek off Pelindaba Road, III. 1939, *Schweickardt* 1333–1341 (B, K, N, W, V). Brits distr.: Jackson's Tuin, III. 1934, *Mogg* 14985 (N).

#### BECHUANALAND PROTECTORATE.

Kanye, III. 1937, *Bunting* 133 (N).

#### TYPE SPECIMEN.

*Rehmann* 4695 in the Botanisches Museum, Zürich, and the Naturhistorisches Museum, Wien are both in Hackel's own hand and thus together constitute the type.

#### ECONOMIC NOTES.

Owing to the very wiry nature of the culms and the stiff leaves, this species is unpalatable.

#### REMARKS.

The author of the present paper has repeatedly searched for this species at the type locality, Koedoespoort, near Silverton, but so far has not been successful in finding it in that locality. The species, however, is comparatively frequent but local in some parts of the Pretoria district and a wide series of specimens has recently been collected. The plants usually occur in large dense tussocks in sandy depressions on the northern slopes of the Magaliesberg. They are readily recognisable by their strictly erect habit and the half-nodding panicles which give them a very characteristic appearance. The plant may easily be confused with *A. diffusa* Trin. var. *Burkei*, but differs from this variety by having subequal glumes, the tips of which are hyaline.

53. *A. stipoides* Lam. Encycl. Method. 157 (1791); Henrard Crit. Rev. 3. 591 (1928); Henrard Monogr. 1. 93 cum ic. tab. 26 (1929).

*A. stipoides* Lam. var. *meridionalis* Stapf sec. Garabedian in Ann. S. Afr. Mus. **16**. II. 405 (1925) pro parte, non Stapf. *A. gracillima* Oliv. in Trans. Linn. Soc. **29**. 173 (1875) cum ic. 114 fig. 1; Dur. et Schinz, Consp. **5**. 803 (1895); Hack. in Bull. Herb. Boiss. **4**. Append. III. 18 (1896).

Robust *perennial*, loosely tufted. *Culms* simple or branched from the upper nodes, up to 100 cm. high; internodes glabrous, slightly striate; nodes glabrous, exserted. *Leaf-sheaths* shorter than the internodes, glabrous, striate; *ligule* a short ciliate rim; auricles woolly; *blades* narrow, flat or involute, up to 20 cm. long, 3–4 mm. wide, smooth on the lower surface, striate and scaberulous on the upper surface. *Panicle* effuse, very lax and open, up to 30 cm. long, scantily flowered; branches bi- or tri-nate, glabrous or scaberulous; pedicels capillary, flexuous or curved or straight, scaberulous, with subclavate tips. *Glumes* pallid, or tinged with purple especially at the base, very unequal, glabrous; the lower up to 7 mm. long, ovate-lanceolate; the upper narrowly linear, 15–20 mm. long, mucronate from a bifid apex. *Lemma* terete, including the callus up to 9 mm. long, smooth but punctulate upwards; *callus* slender, about 2 mm. long, bifid, densely hairy; column of awns scabrous, twisted, 2.5–3 cm. long; awns subequal, scabrous, up to 5.5 cm. long.

#### SOUTH WEST AFRICA.

Olukonda, II. 1886, *Schinz* 671 (Z); Onolongo, *Barnard* 42 (S); Mafa, *Barnard* 815 (S).

#### TYPE SPECIMEN.

The type is deposited in the Lamark Herbarium, Museum d'Histoire Naturelle, Paris.

54. *A. vestita* Thunb. Prodr. 19 (1794); Thunb. Fl. Cap. 1. 394 (1813); Thunb. Fl. Cap., ed. Schult. 104 (1823); Hack. in Engl. Bot. Jahrb. XI. 400 (1889); Dur. et Schinz, Consp. 5. 810 (1894) excl. syn. pro parte; Stapf in Dyer, Fl. Cap. 7. 561 (1899) pro parte et excl. syn. pro parte; F. Bolus in Ann. S. Afr. Mus. 9. IV. 232 (1915) pro parte; Phillips in Ann. S. Afr. Mus. 16. 347 (1917); Stent in Bothalia 1. IV. 278 (1924) pro parte; Henrard Crit. Rev. 3. 663 (1928); Henrard Monogr. 1. 94 cum ic. tab. 27 (1929). *A. vestita* Thunb. forma *amplior* Hack. in Engl. Bot. Jahrb. 11. 400 (1889); Henrard Crit. Rev. 3. 664 (1928). *A. diffusa* Trin. sec. Steud. Syn. Pl. Glum. 1. 142 (1854) pro parte, non Trin. *A. flocciculmis* Mez in Fedde, Rep. 17. 147 (1921); Henrard Crit. Rev. 1. 182 (1926). *A. lanuginosa* Burchell, Travels 2. 226 (1824); Henrard Crit. Rev. 287 (1926). *Chaetaria vestita* (Thunb.) Beauv. Agrostogr. 30 et 152 et 158 (1812); Roem. et Schult. Syst. Veg. 2. 392 (1817).

*Perennial*, robust, densely caespitose, up to 85 cm. high, branched from the base only, often also from some of the culm-nodes. *Culms* about 3-4-noded, erect, rigid, not rarely somewhat wiry; internodes up to 25 cm. long, exserted, the lower densely (sometimes scantily) adpressedly woolly, the upper villous or at length becoming glabrous; nodes glabrous. *Lower leaf-sheaths* broad and papery, straw-coloured and somewhat brittle, adpressedly lanate dorsally and along the margins, eventually becoming glabrous, striate, shorter than the internodes; *ligule* a short ciliate rim, passing into a flake of wool at the auricles; *blades* linear, up to 24 cm. long and 3 mm. wide, either flat or more usually convolute, striate, lower surface glabrous, scabrous, shortly hairy on the upper surface, apex subpungent. *Panicle* pyramidal to subpyramidal, more or less effuse or laxly contracted, up to 20 cm. long and 12 cm. wide; axis striate, glabrous or with scattered white hairs, axillary beards present or absent; rachis of the inflorescence usually scabrous upwards; branches suberect or more usually spreading, scabrous; pedicels longer or shorter than the glumes, scabrous, subclavate at the tips. *Spikelets* pallid or light-brown owing to the colour of the glumes. *Glumes* glabrous, 1-nerved; the lower broadly lanceolate, 4.5 to 7 mm. long, rounded and ciliolate at the tip; the upper glume narrowly-lanceolate, slightly emarginate, 9-13 mm. long. *Lemma* glabrous, 7-11 mm. long from base of callus to articulation, usually mottled; *callus* up to 1.5 mm. long; column variable in length, 2-7 mm. long, strongly twisted; awns unequal, spreading, the central up to 35 mm. long, the lateral however much shorter.

#### SOUTH WEST AFRICA.

Schakalskuppe, II. 1909, Pearson 4801 (BH, K).

#### CAPE PROVINCE.

Gordonia distr.: Upington, IV. 1928, Pole Evans 2182 (N). Hay distr.: Griquatown, XII. 1811, Burchell 1917 (K); do., XII. 1811, Burchell 1842 (K, P); do., Wilman s.n. (K, Mc, N); Niekerk's Hope, X. 1936, Lindeberg 1331 (Mc); Kloof Village, Asbestos Mts., II. 1812, Burchell 2038 (K); Rüdesheim, IV. 1920, Louw 2670 (Mc). Kuruman distr.: Kuruman, III. 1928, Pole Evans 2097 (N); do., I. 1929, Dedman in Hb. Stell. 10049 (St). Barkly West distr.: Barkly West, IV. 1929, Herram 10 (N); Newlands, Paton 691 (Mc). Kimberley distr.: Warrenton, II. 1926, Smith 2347 (N); do., III. 1920, Adams 2671 (BH); Kimberley, I. 1886, Marloth 940 (B, W) et 847 (B, V, W). Mauritzfontein, I. 1934, Pocock s.n. (U); du Toits Pan, Tuck SAM. 19406 (S); Modderivier, II. 1894, Kuntze s.n. (B). Herbert distr.: Honeyestkloof, III. 1920, Wilman 2537 (K, Mc, U) et 1297 (K, Mc). Hopetown distr.: Hopetown, Rehmann 3294 (V). Hanover distr.: Hanover, I. 1902, Galpin 6260 (N). Prieska distr.: Prieska, Bryant 611 (B, K, W).

#### ORANGE FREE STATE.

Fauresmith distr.: Fauresmith, I. 1928, Smith 5242 (N). Bloemfontein distr.: Bloemfontein, Tidmarsh 4936-4939 (GU); Bestersput, Welti 183 (Z). Boshof distr.: Boshof, IV. 1931, Wolff 17 (N). Wepener distr.: Wepener, XII. 1934, Schonken in Hb. Stell. 23330 (St).



## TRANSVAAL PROVINCE.

Bloemhof distr.: Bloemhof, *Burt Davy* 13030 (N); Kameelpan, I. 1934, *Theron* 599 (N).

## WITHOUT PRECISE LOCALITY.

*Burke et Zeyher* 1810 (0).

## TYPE SPECIMEN.

Thunberg's gathering is deposited in the Thunberg Herbarium, Upsala.

## COMMON NAMES.

Beesgras. Bushmangrass. Hardegras. Teesukergras.

## ECONOMIC NOTES.

This species prefers shallow rocky soil where it is often abundant. It stands drought well but is of little value as a fodder.

## REMARKS.

*Buchanan* 124 (BH, K) from Leribe, *Burt Davy* 9375 (N) from Ermelo, and *Atherstone* s.n. from near Lydenburg also belong to this species, but I very much doubt whether the localities indicated by these gatherings are correct.

Gatherings such as *Burchell* 1842 and *Wolff* 17 differ from typical *A. vestita* in that their culms are somewhat fasciated. This gives them an appearance akin to species such as *A. Engleri* and *A. dasydesmis*. They may however be distinguished from the latter species by the adpressedly woolly internodes.

55. *A. meridionalis* *Henrard* Crit. Rev. 2. 344 (1927); *Henrard* Monogr. 1. 95 cum ic. tab. 27 (1929); *Obermeijer*, *Schweickerdt et Verdoorn* in *Bothalia* 3. II. 227 (1937).

*A. stipoides* Lam. sec. *Stent* in *Bothalia* 1. IV. 278 (1924), non Lam. *A. stipoides* Lam. var. *meridionalis* *Stapf* in *Dyer*, Fl. Cap. 7. 562 (189); *Dinter* in *Fedde*, Rep. 15. 342 (1918); *Henrard* Crit. Rev. 3. 592 (1928).

*Perennial*, compactly caespitose. Culms erect, simple or somewhat branched, up to 2 m. high, 2-3-noded; internodes glabrous, striate, fairly thick in robust specimens: nodes usually dark in colour, glabrous, exserted. Leaf-sheaths striate; the lower usually densely woolly especially those of the innovations; the upper usually glabrous and smooth; ligule a short ciliolate rim; auricles with a dense flake of wool, long hairy; collar glabrous; blades narrow, usually involute, up to 50 cm. long and 5 mm. wide, striate and glabrous on the lower surface, scabrous on the upper surface. Panicle large, very lax and effuse, up to 50 cm. long and over 20 cm. wide, many-flowered; rachis smooth; branches 2-3-nate, repeatedly branched, smooth or scaberulous; pedicels capillary, flexuous, scaberulous, with sub-clavate tips, shorter to much longer than the glumes. Glumes unequal, glabrous; the lower 5-7 mm. long; the upper 10-15 mm. long. Lemma terete, 7-9 mm. long, mottled with purple, smooth or slightly punctulate, scaberulous upwards; callus 1.5-2 mm. long, slender, densely hairy, bifid; column of awns slender, twisted, up to 2 cm. long; awns subequal, up to 5 cm. long.

## SOUTH WEST AFRICA.

Ondonga, IV. 1905, *Rautanen* 588 (Z) et 9 (K, V); Tsumeb, I. 1912, *Dinter* 2476 (L); Grootfontein, IV. 1913, *Engler* 6235 (K); Otjiwarongo, III. 1928, *Bradfield* 288 a (N) et V. 1928, *Bradfield* 288 (N); Awas mountains, I. 1916, *Pearson* 9661 (BH, K, S, W); Namutoni to Tsinabis, VIII. 1919, *Pole Evans* H. 19378 (N); Runtu, V. 1939, *Volk* 1716 (D); Nudsas, anno 1939, *Volk* A. 152 (D); Okos, III. 1939, *Volk* 970 (D); Small Waterberg, XII. 1939, *Volk* 565 (D); Asisport, anno 1939, *Volk* A. 2 (D).

## WITHOUT PRECISE LOCALITY.

*Dinter* 3271 (B); *Empire Exhibition* 28 (B, BH, BM, K, P, S, W, Z); *Seiner* 453 (W); *Nels* s.n. (Z); *Boss* TM. 36214 (T).

## CAPE PROVINCE.

Hay distr.: Dunmurray, II. 1923, *Wilman* 2215 (Mc) et VII. 1923, *Coote* 2521 (Mc). Herbert distr.: Honeyestkloof, *Rehmann* 3386 (BM, K, Z). Kimberley distr.: Kimberley, IX. 1919, *Shantz* 202 (W); Picardi, III. 1937, *Wilman* 4091 (Mc, K, N); Modderivier, II. 1894, *Kuntze* s.n. (K). Barkly West distr.: Barkly West, II. 1921, *Wilman* 2142 (Mc). Kuruman distr.: Kuruman, III. 1928, *Pole Evans* 2064 (K, N); do., I. 1929, *Dedman* in Hb. Stell. 10057 (St); between Kuruman and Matlaren River, VII. 1812, *Burchell* 2188 (K); near Dikgatlon, III. 1928, *Pole Evans* 2054 (N). Taungs distr.: Taungs, IX. 1917, *Pole Evans* H. 15834 (N). Vryburg distr.: Vryburg, V. 1912, *Burt Davy* 13726 (N) et 14018 (N); Armoedsvlakte, IV. 1912, *Sharpe* H. 7445 (N); do., VIII. 1920, *Theiler* NH. 20244 (N); do., III. 1924, *Henrici* 92 (N); do., *Stent* H. 21505 (N) et IV. 1912, *Rogers* 21796 (BH). Mafeking distr.: Mafeking, IV. 1929, *Pole Evans* 2390 (N) et 2440 (K, N).

## ORANGE FREE STATE.

Boshof distr.: Beth-el-Pella, IV. 1931, *Wolff* 25 (N). Bloemfontein distr.: Bloemfontein, V. 1909, *Potts* 5139 (N); do., *Pont* 1152 (Z) et 1153 (Z); between Kimberley and Bloemfontein, II. 1877, *Buchanan* 281 (BH, K, S).

## WITHOUT PRECISE LOCALITY.

*Buchanan* 56 (K, D) et 68 (K, D).

## TRANSVAAL PROVINCE.

Pretoria distr.: Pretoria, IX. 1930, *Goossens* 115 (N); do., III. 1929, *Skea* 54 (N); do., I. 1922, *Gower* 19 (N); Lichtenburg distr.: Enselberg Camp, V. 1928, *Pole Evans* 2212 (N); Waterberg distr.: Potgietersrust, III. 1921, *Galpin* 8890 (K, N, W); Zoutpansberg distr.: Zoutpan, IV. 1934, *Schweickerdt et Verdoorn* 604 (N).

## BECHUANALAND PROTECTORATE.

Makarikari Lake, IV. 1931, *Pole Evans* 3275 (K, N); Nkate, IV. 1931, *Pole Evans* 3297 (N) et 3307 (N, K); between Kaotwe and Malopo, IV. 1928, *Nobbs* 73 (U); 30 miles south of Cwiaing Pan, VI. 1937, *Pole Evans* 4026 (N); between Naga Tatollo and Henry's Pan, *Holub* s.n. (K); Gaberones, III. 1930, *Van Son* TM. 28626 (N, T); do., IV. 1928, *Nobbs* 12 (U); Bakhatla Reserve, IV. 1931, *Pole Evans* 3157 (K, N).

## TYPE SPECIMEN.

*Dinter* 2476 is deposited in the Rijksherbarium, Leiden.

## COMMON NAMES.

Haygrass. Klossaad.

## ECONOMIC NOTES.

This species is said to be used as a hay-grass during bad seasons. Owing to its coarseness it is not readily eaten by stock.

## REMARKS.

Henrard in Crit. Rev. 1. 345 (1927) states that the species was described by Dr. Stapf as a variety of *Aristida stipoides* in Flora Capensis Vol. 7. p. 562 . . .". Henrard, however, has selected *Dinter* 2476 in Herb. Leiden as the type and does not use the double citation for his species. It is therefore obvious that he has not based his species on Stapf's variety and that the use of the same epithet "*meridionalis*" does not indicate the raising of the variety to specific rank. It is a pity that Henrard did not select a different epithet to designate his species; it would have precluded any doubt as to whether he has based his species on Stapf's variety or not.

56. *A. dasydesmis* Mez in Fedde, Rep. **17**. 143 (1921); Henrard Crit. Rev. **1**. 131 (1926); Henrard Monogr. **1**. 95 cum ic. tab. 26 (1929); Theron in Fedde, Rep. **40**. 23 (1936).

*A. angustata* Stapf sec. F. Bolus in Ann. S. Afr. Mus. **9**. IV. 232 (1915), non Stapf. *A. vestita* Thunb. sec. Steud. Syn. Pl. Glum. **1**. 142 (1854) pro parte; F. Bolus in Ann. S. Afr. Mus. **9**. IV. 232 (1915) pro parte, non Thunb. *A. vestita* Thunb. var. *parviflora* Trin. et Rupr. Spec. Gram. Stip. 158 (1842); Walp. Ann. Bot. **3**. 747 (1852); Stapf in Dyer, Fl. Cap. **7**. 561 (1899); F. Bolus in Ann. S. Afr. Mus. **9**. IV. 232 (1915); Henrard Crit. Rev. **3**. 668 (1928). *Arthratherum vestitum* (Thunb.) Nees, Fl. Afr. Austr. 174 (1841); Drège, Zwei Pflanzengeogr. Doc. 90 (1843), non *Aristida vestita* Thunb.

*Perennial*, caespitose. Culms many-noded, erect, much-branched from the lower nodes, the fascicled branches culm-bearing, giving the whole plant a very characteristic appearance, glabrous. *Leaf-sheaths* glabrous, the lower soon deciduous, the upper at length slipping from the culms; *ligule* a ciliate rim; auricles minutely pubescent; *blades* more or less erect and stiff, smooth and subpungent, involute, about 1 mm. wide. *Panicle* somewhat contracted, at times fairly dense, up to 10 cm. long and 3 cm. wide; branches binate, the upper usually simple, adpressed to the rachis; branchlets and pedicels slightly scaberulous; the latter shorter than or as long as the glumes. *Glumes* unequal, glabrous; the lower about 5 mm. long, the upper up to 8 mm. long. *Lemma* tubulous, glabrous, including the callus up to 8 mm. long; *callus* 1 mm. long, bearded, truncate, obliquely truncate, rounded or slightly emarginate; column of awns twisted, about 5 mm. long; awns slightly unequal, the central up to 25 mm. long, the lateral up to 20 mm. long.

#### CAPE PROVINCE.

Little Namaqualand distr.: Iaus, IX. 1897, *Schlechter* 11228 (A, B, K, N); Ratel Poort, XII. 1909, *Pearson* 2952 (A, BM, K, N, S); Zilverfontein, Drège (B, BM, G, K, LG, N, O, P, S, V); Rietfontein, XII. 1908, *Pearson* 3768 (BH, K); Rietkloof mountain, II. 1910, *Pearson* 5719 (BH, K); Alewynsfontein, XII. 1908, *Pearson* 3487 (A, BH, BM, D, K, N, S); Kweekfontein, I. 1909, *Pearson* 3803 (A, BM, S). Aberdeen distr.: Camdeboosberg, Drège s.n. (LG). Gordonias distr.: Twinkoppies, III. 1937, *Acock* 2053 (K).

#### TYPE SPECIMEN.

*Schlechter* 11228 is deposited in the Botanisches Museum, Berlin-Dahlem.

#### REMARKS.

The articulation at the apex of the lemma is not always well-developed, in fact *Pearson* 3487 shows the presence of lemmas which are very inconspicuously articulated. As the specimens constituting this gathering are over-mature, the normally developed lemmas have probably already been shed and only the imperfectly developed lemmas have not yet disarticulated.

57. *A. Engleri* Mez in Fedde, Rep. **17**. 147 (1921); Garabedian in Ann. S. Afr. Mus. **16**. II. 402 (1925); Henrard Crit. Rev. **1**. 170 (1926); Henrard Monogr. **1**. 96 cum ic. tab. 29 (1929); Range in Fedde, Rep. **33**. 8 (1933).

*Aristida stipoides* Lam. var. *meridionalis* Stapf sec. Garabedian in Ann. S. Afr. Mus. **16**. II. 405 (1925) pro parte, non Stapf. *Aristida vestita* Thunb. sec. F. Bolus in Ann. S. Afr. Mus. **9**. IV. 232 (1915) pro parte; Garabedian in Ann. S. Afr. Mus. **16**. II. 406 (1925); Range in Fedde, Rep. **33**. 10 (1933); omnes non Thunb.

The facies of this species so closely resembles that of *A. dasydesmis* Mez that unless the spikelets are dissected these two species are not to be distinguished with any degree of certainty. *A. Engleri* has a lemma which is dorsally distinctly scaberulous, furthermore the callus is distinctly bifid whereas in *A. dasydesmis* the callus is truncate or slightly emarginate and the lemma is dorsally glabrous.

#### SOUTH WEST AFRICA.

Gründoorn, II. 1909, *Pearson* 4554 (A, BH, BM, D, K, N, S); Bethanie, IV. 1911, *Range* 1013 (B); Aus, III. 1929, *Dinter* 6128 (B, BH, K); do., X. 1922, *Dinter* 4161 (Z);



Kuibis, *Engler* 6717 (B); do., *Range* 891 (871?) (B); Akam River, II. 1909, *Pearson* 4765 (BH, BM, K, S); Sandverhaar, II. 1909, *Pearson* 4612 (A, D, K); Kleine Karasberge, V. 1931, *Oertendahl* 232 (B); Great Karasberg, I. 1913, *Pearson* 8495 (BH, BM, K, S); Naruda Süd, I. 1913, *Pearson* 8307 (A, BM, D, N, S); Noachabeb, *Blank* 38 (B); Kraaikluft, VI. 1931, *Oertendahl* 483 (B); Lord Hills, I. 1913, *Pearson* 8494 (A, BH, K, N); Dabaigabis, I. 1909, *Pearson* 4406 (BH, BM, K, S); Raman's Drift, I. 1909, *Pearson* 4533 (K).

#### CAPE PROVINCE.

Little Namaqualand distr.: Copperberg, X. 1926, *Pillans* 5648 (BH, K); Alewynsfontein, XII. 1908, *Pearson* 3487 (N). Hay distr.: Postmasburg, III. 1920, *Pole Evans* 72 (K); Dunmurray, III. 1920, *Pole Evans* 80 (K, N); do., II. 1923, *Wilman* 2216 (BH, K, Mc, N). Without precise locality, *Drège* s.n. (LG, O, P).

#### TYPE SPECIMEN.

*Engler* 6717 is deposited in the Botanisches Museum, Berlin-Dahlem.

#### ECONOMIC NOTES.

This species mainly grows in mountain gorges. It is eaten by horses and cattle. Considered a good fodder-grass.

#### 58. *A. diffusa* Trin. var. *genuina* Henrard Monogr. 1. 97 (1929).

*A. diffusa* Trin. var. *densa* (Trin. et Rupr.) Henrard Crit. Rev. 3. 665 (1928); Henrard Monogr. 1. 97 (1929). *A. diffusa* Trin. var. *Eckloniana* (Trin. et Rupr.) Henrard Crit. Rev. 3. 666 (1928). Henrard Monogr. 1. 97 cum ic. tab. 29 (1929). *A. diffusa* Trin. var. *Schraderiana* (Trin. et Rupr.) Henrard Crit. Rev. 3. 668 (1928); Henrard Monogr. 1. 97 (1929). *A. Hystrix* Thunb. Prodr. 19 (1794), non Linn. fil. (1781); Henrard Crit. Rev. 2. 252 (1927). *A. vestita* Thunb. sec. Steud. Syn. Pl. Glum. 1. 142 (1854); F. Bolus in Ann. S. Afr. Mus. 9. IV. 232 (1915); sec. Stanpf in Dyer, Fl. Cap. 7. 561 (1899) omnes pro parte, non Thunb. *A. vestita* Thunb. var. *densa* Trin. et Rupr. Spec. Gram. Stip. 158 (1842); Walp. Ann. Bot. 3. 747 (1852); Henrard Crit. Rev. 3. 666 (1928). *A. vestita* Thunb. a *diffusa* (Trin.) Walp. Ann. Bot. 3. 747 (1852). *A. vestita* Thunb. var. *Eckloniana* Trin. et Rupr. Spec. Gram. Stip. 158 (1842); Walp. Ann. Bot. 3. 747 (1852); Walp. Ann. Bot. 3. 747 (1852); Dur. et Schinz, Consp. 5. 810 (1894). *A. vestita* Thunb. var. *Schraderiana* Trin. et Rupr. Spec. Gram. Stip. 158 (1842); Walp. Ann. Bot. 3. 747 (1852); Stapf in Dyer, Fl. Cap. 7. 561 (1899). *Chaetaria Hystrix* P. de Beauv. sec. Roem. et Schult. Syst. Veg. 2. 390 (1817) pro parte. *A. diffusa* Trin. Trin. Gran. Gen. in Mem. Acad. Imp. Sc. Petrop. Ser. 6. 1. 86 (1830); Kunth, Enum. 1. 193 (1833); Steud. Syn. Pl. Glum. 1. 142 (1854) pro parte. Henrard Crit. Rev. 1. 142 (1928); Henrard Monogr. 1. 96 cum ic. tab. 28 (1929).

Perennial, densely caespitose. Culms simple, erect, 1-2-noded, up to 75 cm. high, firm, glabrous and smooth; internodes terete; nodes exserted. Leaf-sheaths tight, glabrous or the lower covered with a fugacious woolly indumentum; ligule a ciliate rim; auricles pubescent; blades convolute, up to 30 cm. long, 2.5 mm. wide, curved or flexuous, lower surface smooth, upper surface scaberulous or hispidulous. Panicle effuse, up to 15 cm. long and nearly as broad; rhachis straight or somewhat flexuous; branches at length spreading. Spikelets suberect or nodding, purple, purplish-brown or brown. Glumes unequal, glabrous; the lower obtuse, 4-10 mm. long; the upper up to 18 mm. long. Lemma including the callus up to 14 mm. long, almost smooth but usually dorsally scaberulous upwards; callus about 1 mm. long, distinctly bifid, densely bearded; column about 6 mm. long, twisted, scabrous; awns scaberulous, subequal, the central up to 35 mm. long, the lateral up to 30 mm. long.

#### CAPE PROVINCE.

Clanwilliam distr.: Het Kruis, IX. 1912, *Glover et Stephens* 14722 (BH); Boschklouf, *Drège* (891) (B, K, LG, N). Piquetberg distr.: Above Pickeniers Pass, XI. 1910, *Pillans* 5185 (K); Moutons Valley, XI. 1934, *Pillans* 7356 (BH). Malmesbury distr.: Hopefield, XI. 1885, *Backmann* 871 (B, V, Z) et 872 (B, Z) et 677 (B). Ceres distr.: Elandsklouf, XII. 1935, *Levy's* 5098 (U). Paarl distr.: Bains Kloof, XI. 1896, *Schlechter* 9138 (A, B, BH, BM, G, K, N, P, V, W, Z). Stellenbosch distr.: Stellenbosch, XII. 1915, *Bolus* 14921

(BH, D, K, T); do., XII. 1916, *Duthie* 88 (A, K, Sreg); Firgrove, X. 1929, *Sandwith* 154 (K). Cape distr.: Table Mountain, *Ecklon* 976 (B, G, K, N, O); Cape Town, *Harvey* 158 (K); do., *Prior* s.n. (K, S); do., VII. 1928, *Hitchcock* 24088 (K, N, W). Caledon distr.: Caledon, *de Villiers* 16 (N). Swellendam distr.: Between Breede Rivier and Zonder Einde Rivier, *Burchell* 7491 (K). Riversdale distr.: Riversdale, XI. 1892, *Schlechter* 1764 (A, B, G, K, Z); Oakdale, II. 1929, *Levy* 2714 (U) et 2873 (U). Prince Albert distr.: Tygerberg, V. 1907, *Marloth* 4452 b (N). Laingsburg distr.: Whitehill, XI. 1924, *Compton* 2928 (BH). Uitenhage distr.: Above Koega River, *Zeyher* 4505 (S). Zwartkopsriver, *Zeyher* 4504 (N, K, P, V); do., *Zeyher* 447 (A); between Koega and Sunday Rivers, *Drège* (B, N).

#### WITHOUT PRECISE LOCALITY.

*Krauss* s.n. (B); *Pickstone* 51 (B); *Bergius* 236 (B); *Boivin* (B). *Thunberg* (BM, LG); *Masson* (BM, G, P); *Carmichael* (BM); *Pappe* 9722 (BM); *Zeyher* 4405 (K).

#### TYPE SPECIMEN.

The type is deposited in the Trinius Herbarium, Leningrad. The sheet does not bear a collector's name or a number, but merely "*C. B. Sp., Thunberg mis. absque nom.*" Trinius first named the sheet *A. diffusa* but later ? substituted the epithet "*vestita*".

58a. *A. diffusa* Trin. var. *Burkei* (Stapf) Schweickerdt in Notizbl. Bot. Garten u. Mus. Berlin-Dahlem 14. 122 p. 195 (1938).

*A. Burkei* Stapf in Dyer, Fl. Cap. 7. 557 (1899); Phillips in Ann. S. Afr. Mus. 16. 347 (1917) pro parte; Stent in Bothalia 1. IV. 277 (1924); Henrard Crit. Rev. 1. 64 (1926); Henrard Monogr. 2. 183 cum ic. tab. 81 (1932); Theron in Fedde, Rep. 40. 20 (1936); Potts et Tidmarsh in Journ. S. Afr. Bot. 3. II. 88 (1937). *A. vestita* Thunb. sec. Stapf in Dyer, Fl. Cap. 7. 561 (1899) pro parte; Medley Wood, Natal Plants 5. tab. 402 cum descr. (1905); Stent in Bothalia 1. IV. 278 (1924) pro parte, omnes non Thunb. *A. angustata* Stapf sec. Medley Wood, Natal Plants 2. tab. 198 cum descr. (1904), non Stapf.

*Perennial*, densely caespitose. Culms slender, erect, wiry, smooth, up to 75 cm. high, usually 3-more-noded; internodes, terete, glabrous; nodes glabrous. Leaf-sheaths firm and tight, glabrous, usually shorter than the internodes; ligule a line of short hairs; auricles and collar glabrous; blades setaceously convolute, curved or flexuous, up to 30 cm. long or longer, about 3 mm. wide near the base, lower surface striate and glabrous, upper surface scaberulous. Panicle up to 30 cm. long or more, diffuse and open, at times scantily developed and much smaller; rhachis striate, smooth; branches 2-3-nate, up to 15 cm. long or longer, filiform, branched, smooth or scaberulous; branchlets capillary, flexuous; pedicels as long as or longer than the spikelets. Spikelets yellow-brown to pallid, nodding. Glumes unequal, glabrous; the lower up to 6 mm. long; the upper about 12 mm. long. Lemma about 12 mm. long, smooth and glabrous, at times dorsally scaberulous upwards; callus bifid, bearded, about 1.0 mm. long; column 2-5 mm. long, twisted; awns somewhat unequal; the central up to 25 mm. long, the lateral up to 20 mm. long.

#### CAPE PROVINCE.

Ladismith distr.: Ladismith, VII. 1929, *Levy* 4199 (U). Prince Albert distr.: Prince Albert, XII. 1904, *Bolus* 11671 (BH, D, N); Fraserburg Road, I. 1923, *Marloth* 3058 (N); Zwartbulletje, *Drège* (K). Aberdeen Distr.: Aberdeen Road, IX. 1929, *Pole Evans* 2545 (N). Somerset East distr.: Somerset East, *McOwan* 1658 (A, U); Blyde River, V. 1813, *Burchell* 2978 (G, K). Albany distr.: Carlisle Bridge, V. 1921, *Bowker* 16 (A). Komgha distr.: Komgha, III. 1893, *Flanagan* 1780 (BH, N, S). Graaff-Reinet distr.: Graaff-Reinet, IV. 1866, *Bolus* 459 (A, BH, K). Cradock distr.: Mortimer, I. 1902, *Kensit* 21794 (BH). Middelburg distr.: Middelburg, IV. 1922, *Gill* 41 (A, N); do., *Selschop* H. 15163 (N); do., IV. 1911, *Pillans* 1846 (K); Middelburg Road Station, *Flanagan* 1644 (BH, N); Rosmead Junction, III. 1911, *Pillans* 1805 (K). Queenstown distr.: Queenstown, *Everett* 50 (N); Shiloh, *Baur* 964 (K); Fincham's Nek, IV. 1898, *Galpin* 2383 (A, K,

N, W). Wodehouse distr.: Indwe, XI. 1901, *Sim* 2758 (A). Albert distr.: Burghersdorp, *Cooper* 3372 (K). Aliwal North distr.: Aliwal North, *Sister Stephanie* 289 (A, BH); do., anno 1934, *Truter* 7 et 47 et 64 (omnes St). Barkly East distr.: Barkly East, II. 1934, *Greyvenstein* 13 (N). Colesberg distr.: Achtertang Station, V. 1930, *Bennett* 21401 (N). Aliwal North distr.: Eland's Hoek, I. 1904, *Bolus* 10506 (BH, N). Barkly West distr.: Barkly West, XII. 1893, *Bennie* 588 (A). Mafeking distr.: Bultfontein, IV. 1929, *Pole Evans* 2452 (N).

#### WITHOUT PRECISE LOCALITY.

*Burke et Zeyher* 1808 (O); *Zeyher* 1811 (K). Matatiele distr.: Matatiele, III. 1914, *Jacottet* 806 (Z).

#### NATAL PROVINCE.

Klip River distr.: Ladysmith, *Medley Wood* 9100 (D). Dundee distr.: near Dundee, III. 1899, *Medley Wood* 7449 (D) et 7450 (D, K). Zululand, II. 1899, *Jenkinson* 79 (BH, D, K). Coldstream, Drakensberg, *Rehmann* 6929 (V, Z).

#### BASUTOLAND.

Leribe distr.: Leribe, *Dieterlen* 199 a (B, D, K, N, P, S, Z); do., II. 1913, *Phillips* 948 (S). Maluti Mountains, *Staples* 29 et 131 (N). Cana, III. 1905, *Moreillon* 10 (Z).

#### WITHOUT PRECISE LOCALITY.

*Dieterlen* 199 (K, V).

#### ORANGE FREE STATE.

Fauresmith distr.: Fauresmith, V. 1927, *Smith* 3967 (K) et 4014 (K); do., VI. 1927, *Smith* 4168 (K); do., I. 1925, *Pole Evans* 1573 (N). Edenburg distr.: Trompsburg, I. 1925, *Potts* 4533 (GU, N). Bloemfontein distr.: Bloemfontein, II. 1929, *Tidmarsh* 4561 (GU); do., III. 1933, *Koller* 4922 (GU); do., *Kuntze* s.n. (K); do., *Potts* 2395 (B, K) et 2442 (B, K); Glen, III. 1926, *Weyer* 3727 (K). Senelal distr.: Wonderkop, XII. 1931, *Goossens* 849 (K, N); Doornkop, XII. 1931, *Goossens* 888 (K, N, W); Ferrara, XII. 1931, *Goossens* 958 (K, N, W). Bethlehem distr.: Bethlehem II. 1919, *Potts* 4519 (K, N); do., X. 1901, *Richardson* s.n. (B, P, V, W). Heilbron distr.: Heilbron, I. 1931, *Goossens* 418 (N) et 547 (N). Kroonstad distr.: Kroonstad, *Pont* 4 (N) et 99 (GU) et 100 (Z). Hoopstad distr.: Near Hoopstad, *Grindon* s.n. (K, N). Near the Vaalrivier: *Burke* 165 (BM, K, N, S).

#### TRANSCAAL PROVINCE.

Potchefstroom distr.: Klerksdorp, I. 1910, *Weeber* H. 5648 (N). Vereeniging distr.: Vereeniging, II. 1917, *Burt Davy* 17163 (B, N); do., III. 1917, *Burt Davy* 17496 (K, W); do., XII. 1914, *Burt Davy* 15091 (BH); do., IV. 1936, *Story* 57 (N). Heidelberg distr.: Henley-on-Klip, II. 1922, *Stent* H. 21585 (N) et IV. 1925, *Stent* H. 21788 (N); Uitgevalen, XII. 1909, *Burt Davy* 9161 (N). Wakkerstroom distr.: Amersfoort, III. 1917, *Burt Davy* 17363 (K). Volksrust, V. 1920, *Mogg* 7526 (N). Ermelo distr.: Nooitgedacht, I. 1917, *Henrici* 1524 (N, W). Johannesburg distr.: Johannesburg, II. 1925, *Moss* 16255 (W, WR); do., III. 1927, *Moss* 16964 (K); do., II. 1928, *Blenkiron* 765 (K) et 1084 (K); Witpoortje, I. 1898, *Conrath* 879 (V, Z). Pretoria distr.: Pretoria, II. 1929, *Mogg* 16143 (N); do., III. 1905, *Burt Davy* 4514 (N); do., *Nelson* 5 (K); Saltpan, II. 1929, *Leemann* TM. 27302 (T); Hamanskraal, I. 1894, *Schlechter* 4197 (A, B, BM, G, K, V, W); Between Elandsrivier and Klippan, *Rehmann* 5124 (B, BM, K, Z). Waterberg distr.: Makapanspoort, I. 1894, *Schlechter* 4324 (A, B, BM, G, K, T, V); Potgietersrust, *Nelson* 55 (K); Pietersburg distr.: Sand Rivier, II. 1895, *Schlechter* 6908 (B, BM, G, K, V, Z).

#### TYPE SPECIMEN.

*Burke* 165 is deposited in The Herbarium, Royal Botanic Gardens, Kew.



## COMMON NAMES.

Besemgras. Koperdraadgras. Steekgras. Teesuikergras.

## ECONOMIC NOTES.

Opinion differs as to the value of this species. It is said in one case that cattle relish this species, whereas in other cases it is said to be particularly unpalatable even in the young condition. It is supposed to be one of the least palatable grasses in the mountain area. The fruits penetrate the skins of animals and so are injurious to stock.

## REMARKS.

Careful examination of the type (Kew) and isotypes (British Museum, South Afr. Museum) has shown that the lemmas of many spikelets are more or less articulated. This articulation may at times be rudimentary or even absent in many spikelets, but its position and nature is similar to that typical of the well-defined § *Arthratherum*. The degree of development of the articulation in any particular specimen appears to be more or less correlated with the age of that specimen. The presence of a distinctly bifid callus and the very unequal glumes are furthermore important characters in support of my view that *A. Burkei* Stapf has been placed incorrectly by earlier authors in the § *Chaetaria*. The species must moreover be removed from that section to find its natural position in § *Arthratherum*. Because of its close affinity to *A. diffusa* Trin. I have placed it as a variety under that species.

Theron in Fedde, Rep. 14. 7 (1936) places *A. Burkei* in the same category as *A. Marlothii* Hack. and *A. Dregeana* (Nees) Trin. et Rupr. The two last-named species are typical representatives of the § *Stipagrostis*, and members belonging to this section form a morphologically well-defined group. In my opinion it is taxonomically impossible to class together a typical representative of the § *Arthratherum* with members of the § *Stipagrostis*. For this reason I am unable to accept Theron's suggested classification. It may however be possible to subdivide the existing organographic sections more satisfactorily on basis of a combined consideration of the organographic and anatomical characters. Such an investigation (to which cytological investigation could be coupled) would certainly yield interesting results. This work however lies wholly beyond the scope of the present paper.

58b. *A. diffusa* Trin. var. *Pseudo-Hystrix* (Trin. et Rupr.) Henrard Crit. Rev. 3. 471 (1928); Henrard Monogr. 1. 97 (1929).

*A. diffusa* Trin. var. *brevestipitata* (Trin. et Rupr.) Henrard Crit. Rev. 3. 665 (1928); Henrard Monogr. 1. 97 (1929). *A. pseudohystrix* (Trin. et Rupr.) Steud. Syn. Pl. Glum. 1. 142 (1854). *A. vestita* Thunb. sec. Steud. Syn. Pl. Glum. 1. 142 (1854) pro parte, non Thunb. *A. vestita* Thunb. var. *brevestipitata* Trin. et Rupr. Spec. Gram. Stip. 158 (1842); Walp. Ann. Bot. 3. 747 (1852). *A. vestita* Thunb. var. *Pseudo-Hystrix* Trin. et Rupr. Spec. Gram. Stip. 158 (1842); Walp. Ann. Bot. 3. 747 (1852); Dur. et Schinz, Consp. 5. 810 (1894).

The facies of this variety closely resembles that of the species but differs from it by the very short column of the awns. The length of the column is somewhat variable, it may be almost completely absent or reach a length of up to 4 mm. This variation at first led the author of this paper to place one and the same gathering viz. Zeyher 447 under both the vars. *brevestipitata* and *pseudohystrix*. Ecklon and Zeyher s.n. from Uitenhage at one time shared the same lot. Study of more comprehensive material however has shown that the forms of *A. diffusa* having short columns (up to 4 mm.) should all be placed under the var. *Pseudo-Hystrix*.

## CAPE PROVINCE.

Cape distr.: Little Lion's Head, III. 1936, Adamson 808 (U). Tulbagh distr.: Winterhoek, Zeyher NH. 8685 (N). Riversdale distr.: Near Riversdale, XI. 1892, Schlechter 1764 (BH, G). Laingsburg distr.: Whitehill, VIII. 1923, Compton 2881 (BH). Uitenhage distr.: On fields near Zwartkopsrivier, Zeyher 447 (A, BH, K, N, O, Z); do., Zeyher 849 (B); between Koega and Sundays Rivers, Ecklon et Zeyher (A, BH, N); Redhouse,

X. 1908, *Paterson* 263 (A, BH); Zwartkopsrivier, *Drège* (LG); Olifantshoek along Bushman River, *Drège* (B). Port Elizabeth distr.: Port Elizabeth, *E.S.C.A. Herb.* 121 (K). Murraysburg distr.: Murraysburg, III. 1879, *Tyson* 1697 (D). Somerset East distr.: Between Little and Great Fish Rivers, *Drège* (LG).

WITHOUT PRECISE LOCALITY.

*Rohlmeyer* s.n. (B); *Verreaux* s.n. (G); *Boivin* s.n. (K); *Zeyher* s.n. (LG).

#### TYPE SPECIMEN.

The specimen on which Trinius et Ruprecht based their description is deposited in the Trinius Herbarium, Leningrad. It bears no data as to collector or precise locality but "Ar. vestita var. A. Pseudohystrix Cap. b. sp. 1837".

59. *A. mollissima* *Pilger* in Engl. Bot. Jahrb. **40**. 80 (1908); *Schultze*, Namaland et Kalahari 581 (1907) nomen tantum; *Henrard* Crit. Rev. **2**. 354 (1927); *Henrard* Monogr. **1**. 99 cum ic. tab. 30 (1929).

*A. elymoides* *Mez* in Fedde, Rep. **17**. 148 (1921); *Henrard* Crit. Rev. **1**. 166 (1926).

A densely caespitose erect fairly robust *perennial*, including the culms up to 80 cm. high. Culms strictly erect, many-noded, simple, or more rarely scantily branched from the upper nodes; nodes glabrous; internodes exserted, up to 20 cm. long, densely woolly or lanate-tomentose, more or less terete, greenish. Leaf sheaths pallid; the lower lax and slipping off the culmus, striate, almost glabrous or fairly densely woolly tomentose; the upper sheaths glabrous, striate, smooth, terete and tight; ligule a short hairy rim, auricles with a flake of wool or merely ciliate; collar glabrous or minutely pubescent; blades linear (the lower) to filiform (the upper), up to 30 cm. long and 3 mm. wide, but usually much shorter, and narrower, involute, erect or somewhat spreading, acute, lower surface glabrous, smooth and striate, the upper surface scaberulous, tip acute but not pungent. Panicle usually sheathed by the uppermost leaf or shortly exserted, narrow, very dense and spike-like, up to 20 cm. long; axis densely lanate; branches numerous and very short, adpressed, somewhat lanate. Spikelets almost sessile, narrow, glabrous, pallid, erect. Glumes very unequal, shortly awned narrowly-lanceolate, 1-nerved, scabrous on the keel, and minutely scaberulous upwards; the lower from 10–14 mm. long; the upper from 17.5–24 mm. long. Lemma including the callus and up to the articulation 8.5–10 mm. long, tubercus, smooth and very minutely granular; callus 2–2.5 mm. long, acute, densely but shortly hairy; column of the awns 17–26 mm. long, strongly twisted, scabrous; awns more or less equal, scabrous, spreading, 2.8–5.5 cm. long.

#### SOUTH WEST AFRICA.

Okavango area, Runtu, V. 1939, *Volk* 1741 (D).

#### BECHUANALAND PROTECTORATE.

Between Senuma (Sekoma?) and Kooa (Kooi?), I. 1905, *Schultze* 342 i (B, N); Sevrelela (Sevrelela?), X. 1904, *Schultze* 241 a (B).

#### CAPE PROVINCE.

Mafeking distr.: Mafeking, IV. 1929, *Pole Evans* 2435 (K, N). Kimberley distr.: Picardi, III. 1936, *Wilman* 4089 (B, K, L, Mc, N, V, Z).

#### ORANGE FREE STATE.

Kroonstad distr.: Bothaville, VI. 1931, *Boshoff* 8 pro parte (N); do., I. 1933, *Goossens* 1175 (B, N).

#### TYPE SPECIMEN.

*Schultze* 342 i is deposited in the Botanisches Museum, Berlin-Dahlem. The specimen is overmature and thus poor.

60. *A. stipitata* Hack. ap. Schinz in Verh. Bot. Ver. Prov. Brandenb. **30**. 143 (1888); Dur. et Schinz, Consp. **5**. 809 (1894); Hack. in Bull. Herb. Boiss. **4**. Append. III. 19 (1896); Stapf in Dyer, Fl. Cap. **7**. 560 (1899) sub. *A. sieberiana* Trin. var.; Dinter in Fedde, Rep. **15**. 342 (1918); Garabedian in Ann. S. Afr. Mus. **16**. II. 405 (1925); Henrard Crit. Rev. **3**. 590 (1928); Henrard Monogr. **1**. 106 cum ic. tab. 35 (1929); Range in Fedde, Rep. **33**. 9 (1933); Theron in Fedde, Rep. **40**. 28 (1936) [*sphalm. stipitata*].

Densely caespitose erect *perennial*. Culms up to 100 cm. high, robust, glaucous, simple below, usually branched from the upper nodes; internodes compressed (?), glabrous; nodes exerted, glabrous. *Leaf-sheaths*, broad, slipping from the culms, glabrous; *ligule* a ciliate rim; *blades* flat or at length involute, up to 20 cm. long and 2-3 mm. wide, glabrous on the lower surface, scaberulous on the upper surface, glaucous. *Panicle* almost spicate, narrow, dense, contracted, up to 25 cm. long; branches binate, branched from near the base; branchlets and pedicels short. *Glumes* unequal, glabrous; the lower about 10-13 mm. long, scabrous on the keel, acuminate, shortly awned; the upper 20-22 mm. long. *Lemma* 9-10 mm. long including the callus, tubulous, finely punctulate; *callus*  $\pm$  3 mm. long, very acute, densely hairy; column of awns up to 40 mm. long, strongly twisted; awns subequal, capillary, up to 60 mm. long.

#### SOUTH WEST AFRICA.

Omatope, II. 1886, Schinz 658 (K, N, V, Z); Onumakunde, Rantanen 8 (P); Okahandja, II. 1928, Bradfield 278 (T); Gobabis, XII. 1921, Wilman s.n. (BH, S).

#### TYPE SPECIMEN.

Schinz 658 in the Botanisches Museum, Zürich and the Naturhistorisches Museum, Wien are to be regarded as the type.

61. *A. gracilitora* Pilger in Engl. Bot. Jahrb. **33**. 599 (1907); Henrard Crit. Rev. **1**. 211 (1926); Henrard Monogr. **1**. 112 cum ic. tab. 40 (1929).

*A. ramifera* Pilger in Engl. Bot. Jahrb. **33**. 59 (1907); Henrard Crit. Rev. **3**. 492 (1928); Henrard Monogr. **1**. 114 cum ic. tab. 40 (1929). *A. Sieberiana* Trin. sec. Stapf in Dyer, Fl. Cap. **7**. 560 (1899); Stent in Bothalia **1**. IV. 278 (1924); Garabedian in Ann. S. Afr. Mus. **16**. II. 404 (1925), omnes non Trin. *A. stipitata* Hack. sec. Eyles in Trans. Roy. Soc. S. Afr. **5**. IV. 304 (1916) excl. syn., non Hack.

Robust erect caespitose *perennial*. Culms simple below but usually branched from the upper nodes, up to 120 cm. high, about 5-noded; internodes more or less equal, terete, obscurely striate, glabrous, somewhat glaucous; nodes glabrous, exerted. *Leaf-sheaths* glabrous, striate; the lower more or less rigid, lax, the upper fairly lax, glaucous and at length slipping from the culms; *ligule* a ciliate rim; auricles densely long-bearded or only pubescent; collar pubescent or glabrous; *blades* variable in length, up to 30 cm. long, linear, usually convolute, erect or spreading, glabrous and striate on the lower surface, scaberulous on the upper surface. *Panicles* erect, sub-spicate to fairly lax and interrupted, about 20 cm. long, branches adpressed to the rachis or eventually spreading on maturity, solitary to 3-nate, angular, scaberulous on the angles; pedicels slightly scaberulous, usually shorter than the glumes. *Glumes* unequal, acute, awned; the lower about 10 mm. long, scaberulous on the keel; the upper up to 20 mm. long, minutely scaberulous upwards. *Lemma* tubular, somewhat mottled with purple, glabrous, finely punctulate, including the callus up to 11 mm. long; *callus* very acute, densely hairy, 2 mm. long; column of awns very variable in length, up to 25 mm. long, strongly twisted; awns subequal, capillary, spreading, up to 60 cm. long.

#### SOUTH WEST AFRICA.

Onumakunde, III. 1905, Rantanen 8 (Z); Waterberg, V. 1928, Bradfield 388 (K, N); do., I. 1939, Volk 1002 (D); Neidsas, IV. 1939, Volk A. 155 (D); Olamakaris ?, II. 1939, Volk 1191 (D).



## CAPE PROVINCE.

Hay distr.: Near Postmasburg, VI. 1929, *Uys* G. 17 (N). Kimberley distr.: Kimberley, I. 1937, *Acock* 1626 (K, Mc); Carter's Ridge, I. 1937, *Acock* 1605 (K, Mc); Riverton, III. 1918, *Wilman* 2522 (BH, Mc). Barkly West distr.: Droogveld, II. 1934, *Cooke* 3235 (K); Waldeck's Plant, V. 1936, *Cooke* s.n. (K) et XII. 1936, *Acock* 1432 (Mc). Kuruman distr.: Cowley, VI. 1936, *Acock* 458 (Mc). Vryburg distr.: Armoedsvlakte, III. 1921, *Mogg* in Herb. Stell. 12610 (St).

## ORANGE FREE STATE.

Boshof distr.: Smitskraal, VI. 1911, *Burt Davy* 10319 (N) et 10366 (N). Hoopstad distr.: Wesselsbron, I. 1933, *Goossens* 1250 (N); De Rots, II. 1933, *Goossens* 1283 (N). Kroonstad distr.: Bothaville, I. 1933, *Goossens* 1152 (B, N) et 1176 (B, N); do., IV. 1931, *Boshoff* 8 (N). Heilbron distr.: Maccauvlei, II. 1926, *Brandmüller* 118 (N).

## TRANSVAAL PROVINCE.

Bloemhof distr.: Christiana, III. 1912, *Burt Davy* 13030 a (N) et 13113 (N); Cawood's Hope, III. 1912, *Burt Davy* 12984 (N); Kameelpan, I. 1934, *Theron* 527 (N). Wolmaransstad distr.: Boskuil, V. 1929, *Sutton* 112 (N); Vaalbank, IV. 1931, *Liebenberg* 2355 (N, W). Potchefstroom distr.: Ventersdorp, III. 1931, *Pole Evans* 3144 (B, N) et without locality *Theron* 4 (N). Rustenburg distr.: De Put, II. 1933, *Van Nouhuys* 22 (T). Pretoria distr.: Pretoria, XII. 1929, *Liebenberg* 8330 (B, K, N, W); do., IV. 1933, *Smith* 6567 (N); De Wildt, II. 1933, *Irvine* s.n. (N); Klipfontein, VIII. 1880, *Nelson* 103 (K); between Klippan and Elandsrivier, *Rehmann* 5111 (BM, K, V, Z). Waterberg distr.: Twenty-four Rivers, XII. 1919, *Burt Davy* 18259 (K) et 18260 (K); Naboomspruit, I. 1919, *Galpin* M. 425 (N, W); Potgietersrust, I. 1909, *Leendertz* 1983 (T). Zoutpansberg distr.: Messina, II. 1919, *Rogers* 22576 (T). Barberton distr.: Komatipoort, XII. 1897, *Schlechter* 11744 (A, BH, N).

## BECHUANALAND PROTECTORATE.

Mahalapye, IV. 1931, *Pole Evans* 3204 (K, N) et 3207 (N).

## PORTUGUESE EAST AFRICA.

Ressano Garcia, XII. 1897, *Schlechter* 11934 (A, B, BH, BM, G, K, P, V, Z); Lourenco Marques, XII. 1897, *Schlechter* 11966 (BH, BM, G, K, N, P, Z); do., I. 1898, *Schlechter* 11984 (A, B, BH, BM, G, K, N, P, Z); do., *Monteiro* s.n. (K); do., *Junod* 23 (T); do., X. 1919, *Shantz* 337 (K, W); do., VII. 1922, *Moss* 6907 (WR). Chibuto, X. 1935, *Lea* 135 (N); *Maputaland Expedition*, VI. 1914, T.M. 14338 (BH, T).

## TYPE SPECIMEN.

*Schlechter* 11984 is deposited in the Botanisches Museum, Berlin-Dahlem.

## Common NAME.

Steekgras.

## ECONOMIC NOTES.

Opinion differs as to the value of this species as a fodder for stock. It is stated to be eaten in South West Africa whereas in the Western Transvaal and the Orange Free State it is reported to be very coarse and thus unpalatable.

62. *A. hordeacea* Kunth Rev. Gram. 2. tab. 173 (1830); Kunth, Enum. 1. 196 (1833); Walp. Ann. Bot. 3. 746 (1852); Steud. Syn. Pl. Glum. 1. 142 (1854); Dinter in Fedde, Rep. 15. 342 (1918) [spalm. *hordacea*]; Garabedian in Ann. S. Afr. Mus. 16. II. 402 (1925); Henrard Crit. Rev. 2. 241 (1927); Henrard Monogr. 1. 140 cum ic. tab. 54 (1929); Range in Fedde, Rep. 33. 9 (1933).

*A. hordeacea* Kunth var. *longiaristata* Henrard Crit. Rev. 2. 244 (1927); Henrard Monogr. 1. 140 (1929). *A. Steudeliana* Trin. et Rupr. Spec. Gram. Stip. 155 (1842); Henrard Crit. Rev. 3. 588 (1928).

*Annual*, usually fairly robust and much-branched from the base and lower nodes. *Culms* up to 85 cm. high including the inflorescence, or in weak specimens 20-30 cms. high, erect or somewhat geniculately ascending, several-noded; internodes fairly rigid, compressed, striate, densely pubescent with spreading or reflexed short hairs, sometimes becoming almost glabrous, usually exserted; nodes constricted, more or less densely pubescent. *Leaf-sheaths* striate, compressed, keeled, pubescent, with narrow hyaline margins, usually shorter than the internodes; *ligule* shortly ciliate; auricles shortly bearded; collar smooth; *blades* linear-lanceolate, more or less glaucous, flat or folded lengthwise, keeled, acute, scabrous on both surfaces or hirtellous above, many-nerved, up to 30 cm. long and 0.9 cm. wide. *Panicle* linear-oblong or subovate, exserted, in robust plants up to 24 cm. long, but usually much shorter, densely contracted, compact and spike-like, usually only somewhat interrupted at the base; peduncle and axis densely pubescent; branches solitary much-divided from the base; branchlets and spikelets fascicled; pedicels short and pubescent. *Spikelets* congested, linear-lanceolate, greenish or pallid in colour. *Glumes* lanceolate, manifestly awned, 1-nerved, keeled, bifid near the apex, scaberulous dorsally; the lower scabrous on the keel, from 6-11 mm. long excluding the 2.5-5 mm. long awn; the upper smooth on the keel, 7-12 mm. long excluding the 1-4 mm. long awn. *Lemma* narrowly linear, fusiform, with many longitudinal lines of characteristic spiny hairs from the base to the summit, ventrally somewhat furrowed, narrowed towards the apex, up to 7.5 mm. long including the callus, articulation evident; *callus* rounded, short, densely bearded, about 0.5 mm. long; awns subequal, scabrous, erect or somewhat spreading, from 35-50 mm. long.

#### ANGOLA.

Between Gambos and Cabama, V. 1909, *Pearson* 2481 (V) et 2482 (V); without precise locality, VI. 1936, *Martins* 33 (N).

#### SOUTH WEST AFRICA.

Andoni, *Barnard* 813 (K, N, S); Ossa, III. 1939, *Volk* 1564 (D); Fockshof, IV. 1939 *Volk* A. 156 (D). Tsumeb, III. 1934, *Dinter* 7444 (B, N); do., IV. 1913, *Engler* 6405 (B, K, N); Otavi, III. 1925, *Dinter* 5751 (BH, G, GU, N, S, Z); Okatjongeama, *Dinter* 1587 (B); do., *Seiner* 527 (B); Duwib, *Boss* TM. 36022 et 36166 (T); between Okahandja and Waterberg, *Kolon. Wützenhausen* s.n. (B); Hoachanas, III. 1911, *Dinter* 1933 (B).

#### WITHOUT PRECISE LOCALITY.

*Lüderitz* 41 (B, Z) et 65 (B, Z); Bumbo, IV. 1903, *Fritzsche* 17 (B).

#### BECHUANALAND PROTECTORATE.

Francistown, IV. 1929, *Gordon* 49 (N).

#### TYPE SPECIMEN.

The type is deposited in the Botanisches Museum, Berlin-Dahlem.

#### COMMON NAMES.

Sauergras. Wilde Gerste.

#### ECONOMIC NOTES.

This species is not readily eaten by stock. In the young condition however it is eaten to some extent, whereas in the mature condition it is injurious on account of the awns which penetrate the palates of stock.

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# THE GENUS *PLINTHUS*.

By I. C. Verdoorn.

The genus *Plinthus* was described by Fenzl. in "Nov. Stirp. Mus. Vindob. Dec. VII n 60 in 1839 with the single species *P. cryptocarpus*. It was founded on a plant collected by Drège near Rietpoort Nieuweveld. In 1913 (Engl. Bot. Jahrb. vol. 48, p. 499) two further species were described, *P. sericeus* Pax and *P. Rehmannii* Schellenb. They differed from the type species in vegetative characters, the leaves all being alternate and not closely imbricate.

One of the species described for the first time in this paper, *Plinthus karoocicus*, differs from all the described species in the number of the ovary chambers, styles and perianth lobes. While these differences might be considered sufficient to justify the species being placed in a distinct genus, a study of all the available herbarium material shows many characters in common which bind them together into a natural group. It has therefore been decided to amplify the description of the genus *Plinthus* Fenzl. to include this species.

The second species described here agrees with the original generic description as far as the gynoeceum is concerned but differs in the leaves being alternate and loosely arranged, that is each leaf usually shorter than the internode.

## *Plinthus* Fenzl. descr. ampl.

Suffrutex humifusus pilis diaphanis biacuminatis adpressis sericeus. *Folia* minima opposita vel alterna, imbricata, pilis biacuminatis sericea. *Flores* 1-3, axillares, sessiles vel sub-sessiles. *Calyx* 4-5-lobatus, extus pilis biacuminatis sericeus. *Corolla* nulla. *Stamina* 4-5, tubo inserta, cum sepalis alternantia. *Ovarium* 2-3-(rarius 4-) loculare, papillosum vel pubescente, loculis monospermis. *Stylus* 2-3-(rarius 4-) partitus.

## KEY TO SPECIES.

- Ultimate shoots and most of the leaves opposite; the opposite leaves joined by a ridge giving the twigs a jointed appearance; leaves on terminal shoots imbricate:
  - Perianth 5-lobed; ovary 3 (rarely 4-) chambered; styles 3 (4-) partite; leaves 4-6 mm. long. .... *P. cryptocarpus*.
  - Perianth 4-lobed; ovary 2-chambered; styles 2-partite; leaves 2-4 mm. long ..... *P. karoocicus*.
- Ultimate shoots and all leaves alternate; leaves not imbricate:
  - Leaves when fully developed ovate-elliptic, petioled. .... *P. Rehmannii*.
  - Leaves linear to narrowly lanceolate, subsessile, usually longer than the internodes. .... *P. sericeus*.
  - Leaves triquetrous, sessile, usually shorter than the internodes. .... *P. laxifolius*.

*Plinthus karoocicus* Verdoorn sp. nov.; *P. cryptocarpo* Fenzl. affinis sed perianthio 4-lobato ovario 2-loculare, stylo 2-partito differt.

Suffrutex humifusus, ramosus, basi valde lignosus, ramulis tenuibus ultimis oppositis pilis biacuminatis pubescentibus appresse. *Folia* sessila, opposita alterna-que (opposita base transverse connata), imbricata, sub-carnosa, 2-4 mm. longa 0.5-1 mm. lata, dorso convexa, ventro concava, obtuse acuminata, pilis appressis retrorsis bi-acuminatis diaphanis



strigosa. *Flores* axillares, 2-3-nati, 2-3-bracteolati. *Perianthium* 4-lobatum  $\pm 1.75$  mm. longum; tubus 0.75 mm. longus; lobi 1 mm. longi, 0.75 mm. lati. *Stamina* 4; filamenta perianthio longiora. *Ovarium* 2-loculare, 0.75 mm. longum, apice pilis erectis, diaphanis pilosum. *Stylus* 2-partitus, ramis  $\pm$  divaricatis, 1 mm. longis.

A low growing much branched shrublet with a thick woody base and comparatively slender branchlets, the ultimate branchlets opposite, appressed pubescent with bi-acuminate transparent hairs. *Leaves* opposite and alternate, the opposite ones connected at the base by a ridge giving the twig a jointed appearance, imbricate on ultimate shoots, somewhat fleshy, rounded dorsally and concave on the face, bluntly pointed, about 2-4 mm. long, 0.5-1 mm. wide, pubescent with appressed bi-acuminate transparent hairs. *Flowers* axillary, 2-3-nate, 2-3-bracteolate; perianth  $\pm 1.75$  mm. long, 4-lobed; tube .75 mm. long; lobes 1 mm. long, 0.75 mm. broad, ovate. *Stamens* 4, inserted near the base of the tube and alternating with the lobes; filaments as long as or longer than the perianth. *Ovary* crowned with erect transparent hairs, 2-chambered, about 0.75 mm. long and 0.75 mm. diameter. *Style* 2-partite to the base, the branches diverging, about 1 mm. long.

#### ORANGE FREE STATE.

Fauresmith Dist., Heenenweerskop, *Smith* 5286 (Type) Cult. in Plots Fauresmith Veld Reserve, *Verdoorn* 1106, 2287.

#### CAPE PROVINCE.

Middelburg Dist., open veld College of Agriculture, Grootfontein, *Verdoorn* 1527, *du Toit* 29. Kimberley near Schmidts Drift Road. *Acocks in Herb.* *Hafstrom* H 1248; along Boshof Road, *Esterhuysen* 818. Prieska Dist. *Bryant* 343; Brakbosch, between Prieska and Kenhardt *Pole Evans* 2246 and 2247.

#### SOUTH WEST AFRICA.

Aus. *Dinter* 4131.

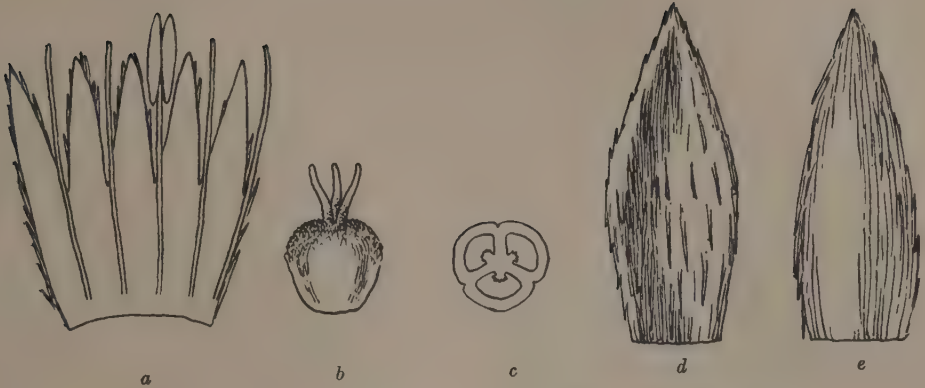
*Note.*—This plant is browsed by sheep in the Karroo and is considered to be a good fodder plant. It is known in the Fauresmith District as "Karoo Ganna".

***Plinthus laxifolius*** *Verdoorn* sp. nov; *P. sericeo* Pax affinis sed foliis laxis internodiis brevioribus differt.

Suffrutex (caulem non vidi) diffusus, ramosus, ramulis tenuibus alternis. *Folia* sessila, alterna, sub-carnosa, 3-7 mm. longa, 1 mm. lata, dorso convexa, ventro leviter canaliculata, obtuse acuminata, pilis appressis bi-acuminatis diaphanis pubescentia. *Flores* 2-3-bracteolati, axillares, 1-3-nati, in ramulis ultimis brevissimis pseudo glomerati. *Perianthium* 5-lobatum  $\pm 1.75$  mm. longum; tubus 0.75 mm. longus; lobi 1 mm. longi, 0.5 mm. lati, dorso pilis biacuminatis diaphanis sericei. *Stamina* 5; filamenta perianthio breviora, 0.75 mm. longa. *Ovarium* 3-loculare, papillosum, 0.5 mm. longum. *Stylus* 3-partitus, ramis  $\pm$  divaricatis, 0.5 mm. longis.

A much branched shrublet with slender branches, but basal part not seen; the younger oppressed pubescent with bi-acuminate, transparent hairs. *Leaves* all alternate, rather lax, mostly shorter than the internodes, somewhat fleshy, 3-7 mm. long, 1 mm. wide, rounded on the back and slightly canaliculate on the face, bluntly pointed, oppressed pubescent with bi-acuminate transparent hairs. *Flowers* 2-3-bracteolate in the axils of the leaves 1-3-nate, appearing glomerate in the upper leaves where they are clustered on very much abbreviated axillary shoots, not longer than the subtending leaf. *Calyx* 5-lobed; tube 0.75 mm. long; lobes 1 mm. long, 0.5 mm. wide, dorsally oppressed pubescent with bi-acuminate transparent hairs which project above the apex of the lobe. *Stamens* 5; filaments shorter than the calyx, 0.75 mm. long. *Ovary* 3-chambered, papillose, 0.5 mm. long; style 3-partite, branches diverging, 0.5 mm. long.

"Kalahari Sand Dunes", exact locality unknown, probably Kenhardt district, *Kotze* 824.



I.—*Plinthus cryptocarpus* Fenzl. Flower from Drege specimen ex Stockholm.

- (a) Perianth slit one side, shewing attachment of stamens.
- (b) Ovary and styles.
- (c) Transverse section of ovary.
- (d) Bract, dorsal view.
- (e) Bract, shewing inner surface.



II.—*Plinthus karooicus* Verdoorn. Flower from I. C. Verdoorn 1106.

- (a) Perianth slit one side, showing attachment of stamens.
- (b) Ovary and styles.
- (c) Transverse section of ovary.
- (d) Bract, showing inner surface.
- (e) Bract, dorsal view.





# OTTO KUNTZE TYPE SPECIMENS OF SOUTH AFRICAN PLANTS.

By R. A. Dyer.

In 1898 Otto Kuntze published his "*Revisio Generum Plantarum* vol. 3 pt. 2". In this he included an enumeration of specimens collected during his travels in South America (1891-2) and in South Africa (1894). An examination by American botanists of Otto Kuntze's type specimens of South American plants housed in the Herbarium of the New York Botanical Garden, revealed a large percentage of errors of identification. The suggestion was then made by the Head Curator of the Herbarium that an examination of the South African types would yield equally interesting results and that the types would be forwarded on loan to the National Herbarium, Pretoria, if it was desired to undertake the work. The offer was gratefully accepted and the present paper is the outcome.

As a general rule the types were found to be in a poor state of preservation due mainly to faulty preparation in the first place. Many of the specimens show marked evidence of mould. Not all the types cited by Kuntze were located in the New York Herbarium and it was suggested that some of those outstanding might have been misfiled. The following types were not seen by me, the page numbers being those of Kuntze's work cited above :—

*Nasturtium riparium*, p. 6.  
*Geranium robustum*, p. 32.  
*Acacia latibracteata*, p. 48.  
*Alepidia aquatica*, p. 110.  
*Anisothrix Kuntzei*, p. 129.

*Crocodylodes (Berkheya) amplexicaule*, p. 143.  
*Euphorbia laxiflora*, p. 286.  
*Sapium Simii*, p. 293.  
*Tragia Bolusii*, p. 293.

Some of these have been cited by later workers and in such cases their identifications are given with the reference to the respective publications. *Indigofera Kuntzei* (*Anila Kuntzei*) from Mosambique and *Limeum glaberrimum* from Delagoa Bay have been omitted. In most other cases the types have been matched with specimens in the National Herbarium, Pretoria. The examination of types of new varieties was not undertaken. It has been found necessary to establish the following new names and new combinations :—

*Berkheya microcephala* comb. nov. (*Stobaea microcephala* DC.) in a note under *Berkheya Kuntzei*.

*Senecio Verdoorniae* nom. nov. (*Hertia Kuntzei*).

*Senecio paucicephalus* nom. nov. (*Hertia natalensis*).

*Gnidia gymnostachya* (C. A. Mey.) Gilg. var. *phaeotricha* M. Moss comb. nov. (*Gnidia phaeotricha*).

*Gnidia sericocephala* (Meisn.) M. Moss comb. nov. (*Gnidia pretoriae*).

The identifications of the types are given in the order in which the descriptions appear in Kuntze's *Revisio*. Where necessary the revised name follows that of Kuntze and the present accepted name is given in heavy type. I wish to express my appreciation of assistance with some of the indentifications by specialists in certain groups. The names of such workers appear under the respective species or family.

## TILIACEAE.

*Grewia Krebsiana* O. Kuntze, p. 26.—Cape Province ; Beaufort West.

*G. robusta* Burch. Trav. 2, 133 (1824) ; Burret in Engl. Bot. Jahrb. 45, 195 (1911).

*G. flava* Harv. in Fl. Cap. I, 225 (1859–1860) not of DC.

## MALPIGIACEAE.

*Triaspis transvalica* O. Kuntze, p. 29.—Transvaal ; Pretoria.

*Spheadamnocarpus transvaalicus* (O. Kuntze) Burtt Davy Fl. Transvaal I, 284 (1932) : (*S. transvaalica* in error).

As in several other instances Kuntze omits one *a* from *vaal* in forming the specific epithet from Transvaal.

## GERANIACEAE.

*Geranium robustum* O. Kuntze, p. 32 ; R. Knuth in Das Pflanzenr. 4, 129. 166 (1912)—Natal ; Charlestown.

## RHAMNACEAE.

*Phyllica glabriflora* O. Kuntze, p. 39.—Cape Province ; Caledon.

*P. brevifolia* E. & Z. Enum. 133 (1834).

Identification by N. S. Pillans.

## (Ampelidaceae) VITACEAE.

*Vitis* (*Cissus*) *cradockensis* O. Kuntze, p. 40.—Cape Province ; Cradock.

*Cissus quinata* Ait. Hort. Kew. ed. 2, I. 260 (1810) ; Gilg & Brandt in Engl. Bot. Jahrb. 46, 521 (1912).

*Vitis* (*Cissus*) *repandospinulosa* O. Kuntze, p. 41.—Natal ; Ladysmith.

*Cissus humilis* (N.E.Br.) Planch. in DC. Mon. Phan. 5, 2, 463 (1887) ; Gilg & Brandt l. c. 488.

The Kuntze type is very mouldy and under this unnatural covering can be seen scattered hairs on the stem and inflorescence. The term *glaberrima* used by Kuntze in the description is therefore inaccurate.

Authenticated material of *Cissus dolichopus* C.A.Sm. in the Nat. Herb. Pretoria, exhibits a variable pubescence and it is considered that this name should also be referred to the synonymy of *C. humilis* (N.E.Br.) Planch.

## MELIANTHACEAE.

*Melanthus insignis* O. Kuntze, p. 43.—Natal ; Charlestown.

*M. Dregeana* var. *insignis* Phill. & Hofmeyr in Bothalia 2, Ib. 352 (1927).

*M. comosus* Burtt Davy in Fl. Transvaal I, 490 (1932), not of Vahl.

The type consists of two sheets, one each of flowers and fruits. Although closely allied to *M. Dregeana* the Kuntze species is sufficiently distinct to justify specific separation. In addition to its more robust habit, larger flowers and more densely pilose appearance, the fruits are considerably larger (1.5 cm. long) sub-oblong, with the valves strongly inflexed at the apex forming a depression, and not developed into a strong point as done by the inflexed valves of *M. Dregeana* Sond.

## LEGUMINOSAE.

*Anila pretoriana* O. Kuntze, p. 52.—Transvaal; Pretoria.

*Indigofera pretoriana* Harms ex O. Kuntze l. c.

*Calpurnia mucronulata* Harms ex O. Kuntze, p. 54.—Natal; Van Reenen's Pass.

*C. intrusa* E. Mey. Comm. Pl. 2 (1835).

*Cracca triphylla* O. Kuntze, p. 57.—Natal; Krantzklloof.

*Tephrosia macropoda* E. Mey. Comm. Pl. 112 (1835).

*T. triphylla* Harms ex O. Kuntze l. c.

Identification by H. M. L. Forbes.

## ROSACEAE.

*Alchemilla Woodii* O. Kuntze, p. 75.—Natal; Charlestown.

This species is very closely allied to *A. capensis* Thunbg. and is distinguished from it by the shortly pedicellate flowers somewhat exserted from small leaf-like bracts, and the much shorter outer calyx-lobes.

## CRASSULACEAE.

*Sedum* (*Crassula*) *cogmansense* O. Kuntze, p. 83.—Cape Province; Cogmansklloof.

*Crassula cogmansensis* (O. Kuntze) K. Schum. in Just. Jahresb. 26, I. 347 (1900).

The type has not been matched with any specimen in the Nat. Herb. Pretoria. It belongs to the section *Sphaeritis* Harv. and is evidently closely allied to *C. subaphylla* (E. & Z.) Harv., but differs in the short glabrous, ovate-acute leaves. The plant is apparently somewhat laxly branched. Schonland in Trans. Roy. Soc. S. Afr. 1930 omits mention of *C. cogmansensis*.

*Sedum crassiflorum* O. Kuntze, p. 84.—Natal; Glencoe.

*Crassula vaginata* E. & Z. Enum. 298 (1836).

*C. crassiflora* (O. Kuntze) K. Schum. l. c.

Schonland, l.c. 226, gives the name as "*Cr. crassifolia* O.K.n.sp." possibly taking it incorrectly from a herbarium sheet of the type number. The type sheet has written on it "*Sedum crassiflora*".

*Sedum* (*Crassula*) *transvalense* O. Kuntze, p. 85.—Transvaal; Johannesburg.

*Crassula transvaalensis* (O. Kuntze) K. Schum., l.c.

Schumann, it will be noted, corrected the spelling of the specific epithet. The label of the type specimen is written up as "*Crassula transvaaliensis* O.K." and Schonland, l.c. 188, has used this form.

## (Bruniaceae) VERBENACEAE.

*Ptyxostoma quadrifidum* O. Kuntze, p. 86. (Bruniaceae); Cape Province; Caledon.

*Campylostachys cernua* Kunth in Abh. Akad. Berlin 1831, 207 (Verbenaceae).

Kuntze went completely astray in the identification of this plant. Drawings of dissections on the type sheet are inaccurate. The type matches several authentically named specimens of *Campylostachys cernua* in the Nat. Herb. Pretoria, including duplicates of the Burchell and Zeyher gatherings.



## LYTHRACEAE.

*Nesaea Kuntzei* Koehne ex O. Kuntze, p. 97.—Natal; Ladysmith.

The type is not matched in the Nat. Herb. Pretoria.

## FICOIDEAE.

(Identifications by Dr. L. Bolus.)

*Mesembryanthemum cradockense* O. Kuntze, p. 109.—Cape; Cradock.

There are two mounted specimens of this in the New York Herbarium.

*Mesembryanthemum pulvinatum* O. Kuntze, p. 109.—Cape Province; Beaufort West.

*Chamatophyllum musculinum* (Haw.) Schw. in Zeitschr. Sukkulantenk. 3, 30 (1927).

There are four sheets of this in the New York Herbarium.

*Mesembryanthemum subspinosum* O. Kuntze, p. 109.—Cape Province; Cradock.

*Drosanthemum obliquum* (Willd.) Schw., l.c. 18.

"As far as the material goes the Kuntze type agrees with this species" L. Bolus.

## UMBELLIFERAE.

*Alepida aquatica* O. Kuntze, p. 110.—Cape Province; Toise River Station.

*Alepidea amatymbica* Ecklon & Zeyher Enum. 1836, 339; Dümmer in Trans. Roy. Soc. S. Afr. 3, 5 (1913).

## RUBIACEAE.

*Plectronia Chamaedendrum* O. Kuntze, p. 122.—Natal.

*Pygmaeothamnus Chamaedendrum* (O. Kuntze) Robyns Monog. Vangueriae 1928, 35.

## DIPSACEAE.

*Cephalaria natalensis* O. Kuntze, p. 126.—Natal; Van Reenen's Pass.

Except that it is somewhat more densely pubescent the type is well matched by several specimens in the Nat. Herb. Pretoria.

## COMPOSITAE.

*Berkheyopsis Kuntzei* O. Hoffm. ex O. Kuntze, p. 136.—Cape; Modderriver Station.

*B. Echinus* (Less.) O. Hoffm. in Engl. Prantl. Natur. Pflanz. Fam. 4, 5. 311 (1894).

*Gazania Burchellii* DC. Prod. 6, 514 (1837); Harv. in Fl. Cap. 3. 479 (1864–1865) in part.

Harvey, l. c., cites several specimens under *Gazania Burchellii*. Judging by the description of the type and by an examination of a duplicate of Zeyher 976, one of the cited specimens, it appears likely that Harvey included two distinct species under the one name. The specimen of Zeyher 976, in the Nat. Herb. Pretoria, is a small plant agreeing with Harvey's description as far as it goes. Further, it has obtuse lacerate outer pappus scales, and those of the inner row are glabrous, whereas, in the majority of specimens in the Nat. Herb., which agree better with De Candolle's description of *G. Burchellii*, the outer pappus scales are linear-lanceolate, occasionally slightly lacerate in the upper half: the inner row are lanceolate and pubescent. These specimens agree also with the type of *Berkheyopsis Kuntzei*. On the assumption, however, that Harvey was correct in associating *Hirpicium Echinus* Less. (1832) with *Gazania Burchellii* DC. (1837), the Kuntze type of *Berkheyopsis Kuntzei* O. Hoffm. is identified as *B. Echinus* (Less.) O. Hoffm.

*Cotula radiata* O. Hoffm. ex O. Kuntze, p. 142.—Cape Province; Toise River Station.

**Matricaria nigelliflora** DC. Prodr. 6, 50 (1837).

The type specimen of *Cotula radiata* O. Hoffm. was not well prepared and during drying the leaves shrivelled and lost the characteristic glaucous appearance.

*Crocodylodes amplexicaule* O. Kuntze, p. 143.—Natal; Krantzklouf.

**Berkheya amplexicaulis** O. Hoffm. ex O. Kuntze l.c.

No specimen seen.

*Crocodylodes arctiifolium* O. Kuntze, p. 143.—Natal; Van Reenen's Pass.

**Berkheya montana** Wood & Evans in Journ. Bot. 1897, 351.

*B. arctiifolia* O. Hoffm. ex O. Kuntze l.c.

The Kuntze specimen is covered with an unnatural "cobweb" which makes the indumentum appear denser than it is in reality.

*Crocodylodes Kuntzei* O. Kuntze, p. 143.—Cape; Modder River Station.

**Berkheya Kuntzei** O. Hoffm. ex O. Kuntze l.c.

There are two specimens of this in the New York Herbarium, the type from Modder River Station and the other from Aliwal North. They show a close relationship to *Berkheya microcephala* comb. nov. (*Stobaea microcephala* DC.)

*Gnaphalium amplum* O. Kuntze, p. 150.—Natal; Krantzklouf.

**Helichrysum platypterum** DC. Prodr. 6, 201 (1837).

*H. amplum* O. Hoffm. ex O. Kuntze l.c.

Moeser in Bot. Jahrb. 44. 341 (1910) suggests the above identification and this seems justified.

*Gnaphalium athrixifolium* O. Kuntze, p. 150.—Natal; Colenso.

**Helichrysum athrixiifolium** O. Hoffm. ex O. Kuntze l.c.

Moeser l, c. 221, upholds this species. It is very closely allied to *H. rugulosum*, Less. and *H. polycladum* Klatt, being about intermediate between these in the size of the capitulum: the involucre bracts are light straw coloured as in *H. rosum* Less., another closely allied species.

*Gnaphalium Kuntzei* O. Kuntze, p. 152.—Natal; Charlestown.

**Helichrysum Kuntzei** O. Hoffm. ex O. Kuntze, l.c.

Moeser, l.c., 279, upholds this species. It is closely allied to *H. simillimum* DC. and *H. capitellatum* Less.

*Gnaphalium mixtum* O. Kuntze, p. 152.—Cape Province; Cathcart.

**Helichrysum mixtum** O. Hoffm. ex O. Kuntze, l.c.

Moeser, l.c., upholds this species but mentions that it is difficult to justify this owing to the close similarity to *H. longifolium* DC. and the apparent polymorphism in species of this group.

*Gnaphalium plantaginifolium* O. Kuntze, p. 153.—Cape Province; Cathcart.

**Helichrysum coriaceum** Sond. in Linnaea 23, 65 (1850) not of Harv.; Moeser, l.c. 264.

*H. plantaginifolium* O. Hoffm. ex Kuntze, l.c.

*Gnaphalium pulviniforme* O. Kuntze, p. 153.—Natal; Van Reenen's Pass.

**Helichrysum Sutherlandi** Harv. in Fl. Cap. 3, 218 (1864-1865); Moeser, l.c. 306.

*H. pulviniforme* O. Hoffm. ex O. Kuntze, l.c.

*Gnaphalium Thapsus* O. Kuntze, p. 154.—Natal; Highlands Station.

*Helichrysum Thapsus* O. Hoffm. ex O. Kuntze, l.c.; Moeser, l.c. 263.

*Hertia Kuntzei* O. Hoffm. ex O. Kuntze, p. 157.—Transvaal; Pretoria.

*Senecio Verdoorniae* nom. nov.

The Kuntze type is almost identical with *Verdoorn* Nos. 635, 636, 663 and other specimens in the Nat. Herb. Pretoria collected in the Fountains Valley, Pretoria, which is as likely as not where Kuntze collected his type.

*S. Verdoorniae* is closely allied to *S. albanensis* DC. and one was inclined to regard it as a variety of that species, but *S. albanensis*, already credited with a multitude of forms, and a somewhat unwieldy species in consequence, would have been "stretched" to breaking point to accommodate it. Some of the so called forms of *S. albanensis* may later be segregated as specifically distinct.

The existence of the name *Senecio Kuntzei* necessitates the application of a new name for Kuntze's species, *Hertia Kuntzei*.

*Hertia natalensis* O. Hoffm. ex O. Kuntze, p. 157.—Natal; Mooi River Station.

*Senecio paucicephalus* nom. nov.

The Kuntze type is very closely allied to *Senecio albanensis* var. *leiophyllus* Harv. The capitula are solitary on the scapes and a very close match is present in Mogg 7061, which has two capitula on the scape. This was collected in the same area as the type. The base of two capitula on the type are enlarged in a manner suggesting some "fly" infestation which is not an unusual occurrence in the *Compositae*. The author overlooked the abnormality and described the involucre "involucro fructifera basi suberoso-incrassato". Only a single short narrow ray-flower was observed in a capsule on the sheet. Assuming that Kuntze's specimen is specifically distinct from *S. albanensis*, it requires a new name as the specific epithet *natalensis* is already occupied in the genus *Senecio*.

*Leontonyx Pumilio* O. Hoffm. ex O. Kuntze, p. 162.—Cape Province; Beaufort West.

*Helichrysum laneum* S. Moore in Journ. Bot. 1918, 6.

The name *Helichrysum pumilum* Hook. f. is applied to a distinct species and to avoid ambiguity the Hoffm. epithet should not be used.

*Leontonyx ramosissimus* O. Hoffm. ex O. Kuntze, p. 162.—Cape Province; Cradock.

*Helichrysum lucilioides*, Less. Syn. Comp. 290 (1832).

The type of *Leontonyx ramosissimus* O. Hoffm. shows obvious signs of having been grazed and is consequently unnaturally dwarfed.

*Osteospermum glaberrimum* O. Hoffm. ex O. Kuntze, p. 165.—Natal; Krantzklouf.

The type has not been matched exactly but it is possibly a form of *O. imbricatum* L., a species which, according to the view of T. Norlindh, is extremely variable. The type differs from all other specimens examined by the absence of the characteristic glandular hairs on the peduncle and pedicels.

*Senecio arabadifolius* O. Hoffm. ex O. Kuntze, p. 171.—Cape Province; Molteno.

The type agrees well with *Flanagan* 2726 (collected between Cala and Encobo) and *Dieterlen* 1073 (Basutoland) but is slightly more glandular-pubescent than these and in this respect differs from the closely allied species *S. pseudorhyncholeucus* Thell. 1923, which, however, might, with reason, be considered as only a form of *S. arabadifolius*.

*Senecio cathcartensis* O. Hoffm. ex O. Kuntze, p. 172.—Cape Province; Cathcart.

The type was not matched exactly, but approaches closely to *S. erubescens* Ait. Features of importance are the long-petioled basal leaves and the glabrous leaves and achenes.



**Senecio colensoensis** O. Hoffm. ex O. Kuntze, p. 172.—Natal; Colenso.

This appears most nearly allied to *S. pentactinus* Klatt. It is matched closely in the Natal Herbarium, Durban, but not in the Nat. Herb. Pretoria.

**Senecio fibrosus** O. Hoffm. ex O. Kuntze, p. 174.—Cape Province; East London.

*S. pachyhelis* Phill. & Smith in Rep. Vet. Serv. & Anim. Ind. S. Afr. 1931, 640.

This is another species extracted from the *S. albanensis* complex.

**Senecio Kuntzei** O. Hoffm. ex O. Kuntze, p. 175.—Natal; Van Reenen's Pass.

**S. glaberrimus** DC. Prod. 6, 403 (1837).

The Kuntze type agrees with several authentically named specimens in the Nat. Herb. Pretoria.

**Senecio lunayaeifolius** O. Hoffm. ex O. Kuntze, p. 175.—Natal; Highlands Station.

**S. paucicalyculatus** Klatt in Bull. Herb. Boiss. 4, 468 (1896).

The label on the type bears the name *S. launaeifolius* O. Hoffm.

**Senecio subrubriflorus** O. Hoffm. ex O. Kuntze, p. 178.—Natal; Van Reenen's Pass.

*S. viscidus* N.E. Br. in Kew Bull. 1901, p. 125.

This species is closely allied to *S. rhyncholaenus* DC., *S. arabidifolius* O. Hoffm. and *S. pseudo-rhyncholaenus* Thell. mentioned above. It differs from all these in the slightly larger capitula with more exserted florets. It has not been matched exactly in the Nat. Herb. Pretoria, but there is a number of specimens, including Wood 5221, from Mooi River, which are considered equal to it. There is no doubt that the species mentioned above and their allies require very careful study with a view to a revision. The value of characters such as colour of flower, habit, etc., for species delimitation must be given special attention.

#### CAMPANULACEAE.

**Dortmannia decurrentifolia** O. Kuntze, p. 187.—Cape Province; East London.

**Lobelia Erinus** Linn. var.

*L. Erinus* Linn. var. *bellidifolia* Sond. in Fl. Cap. 3, 544 (1864–1865) in part at least.

A decision whether to recognise several closely allied species to *L. Erinus*, or to regard the latter as a composite species with several varieties is left for a monographer to decide. There are several older epithets than *decurrentifolia* to be taken into account in this complex.

**Dortmannia vanreenensis** O. Kuntze, p. 188.—Natal; Van Reenen's Pass.

**Lobelia patula** L.f. Suppl. 1781, 395.

The Kuntze type agrees with several specimens in the Nat. Herb. Pretoria, which are apparently correctly named.

**Lightfootia corymbosa** O. Kuntze, p. 188.—Natal; Krantz-kloof.

**L. Huttoni** Sond. in Fl. Cap. 3, 556 (1864–1865).

The Kuntze type is evidently only a slightly more robust form than the typical form of *L. Huttoni*.

#### EBENACEAE.

**Royena Guerkei** O. Kuntze. p. 196.—Natal; Charlestown.

The type specimen is somewhat defoliated but the leaves that are present, and the fruit preserved in a capsule are matched very closely by several specimens in the Nat. Herb. Pretoria. They are probably not specifically distinct from specimens referred to *R. ambigua*

by Hiern in Fl. Cap. 4, 1. 457 (1906), not of Vent. It might be contended that these represent forms of *R. pallens* Thunbg., but in the present uncertain state of our knowledge of this group it seems advisable to retain *R. Guerkei* with specific rank.

**Royena Simii** O. Kuntze, p. 196. p.—Cape Province ; Kingwilliamstown.

#### BORAGINACEAE.

*Heliotropium Kuntzei* Guerke ex. O. Kuntze, p. 205.—Cape Province ; Modder River Station.

**H. lineare** (E. Mey.) C. H. Wright in Fl. Cap. 4, 2.9 (1904).

Although Wright did not include the name *H. Kuntzei* in his account of the genus, l.c.7., the Kuntze type agrees very closely with specimens named *H. lineare* by him.

#### SCROPHULARIACEAE.

*Harveya cathcartensis* O. Kuntze, p. 234.—Cape Province ; Cathcart.

**H. speciosa** Bernh. ex Krauss in Flora 1844, 831.

The anthers of the type specimen of *H. cathcartensis* have only one developed anther theca, which is a characteristic feature of *H. speciosa*. Although the type of *H. cathcartensis* has a more congested inflorescence than is usual for *H. speciosa* it is not considered specifically distinct from it.

**Limosella longiflora** O. Kuntze, p. 235.—Natal ; Van Reenen's Pass.

*L. lineata* Glk. in Bot. Jahrb. 66, 555 (1934).

*L. aquatica* auctorum non Linn.

*L. tenuifolia* auctorum non Nuttall.

*L. aquatica* var. *tenuifolia* auctorum nec Wolff nec Hoffm.

Glück, l.c., 556, retained *L. longiflora* O. Kuntze as distinct from his *L. lineata*, apparently basing his conclusion on Kuntze's description. The distinction drawn is the strongly 5-nerved calyx of the former. The nervation is certainly more pronounced in the Kuntze type than in most specimens of *L. lineata* in the Nat. Herb. Pretoria, but even on the Kuntze type the nervation is not uniformly conspicuous and in some flowers it is no more so than in some specimens of *L. lineata*. For this reason the name *L. longiflora* is adopted.

**Nycterina Microsiphon** O. Kuntze, p. 238.—Natal ; Van Reenen's Pass.

**Zaluzianskya Microsiphon** K. Schum. in Just. Jahresb. 24, I. 395, Hiern in Fl. Cap. 4, 2.344 (1904).

The type specimen consists of a stout perennial herbaceous plant broken into two pieces, the basal portion having been detached from the rootstock. The terminal portion was evidently damaged during or prior to the flowering period, resulting in the production of ten or more lateral branches, each bearing flowers in the axils of the upper bracts. Three flowers were dissected, two of which were found to have been damaged by insects, the other however, contained two stamens and two staminodes. The specimen was not matched in the Nat. Herb. Pretoria.

#### LABIATAE.

**Plectranthus Kuntzei** Guerke ex O. Kuntze, p. 260.—Natal ; Clairmont.

The type specimen appears to be specifically equal to a specimen of *Wood* 3390 named at Kew as *P. petiolaris* E. Mey. and cited in Fl. Cap. 5, I. 272 (1910). *Wood* 3390, however, is much more slender than a duplicate of *Rudatis* 339 (identified as *P. petiolaris* E. Mey.)

from Alexandra County, Natal, which is much nearer to the type locality of *P. petiolaris* in Pondoland. There is some measure of doubt, therefore, whether *P. Kuntzei* is conspecific with *P. petiolaris* and it is not deemed profitable to make a dogmatic statement on the issue in the light of inadequate records.

*P. parviflorus* Guerke ex O. Kuntze, p. 261.—Cape Province ; East London.

**P. strigosus** Benth. ex E. Mey. Comm. 229 (1837).

As suggested in a note under *P. parviflorus* in Fl. Cap. 5, I. 281 (1910), the above synonymy appears well justified.

**Stachys Kuntzei** Guerke ex O. Kuntze, p. 262.—Natal ; Van Reenen's Pass.

This species is retained by Skan in Fl. Cap. 1.c. 344.

#### POLYGONACEAE.

**Oxygonum delagoense** O. Kuntze, p. 268.—Delagoa Bay.

This species is retained by Wright in Fl. Cap. 5, I. 461 (1912). The classification of specimens in this genus is largely dependent on fruiting material and this is rarely satisfactorily preserved. The Kuntze type specimen is now without fruits and the type of his variety *robustum* is without either flowers or fruits.

#### PROTEACEAE.

*Protea conchiformis* O. Kuntze, p. 278.—Cape Province ; Caledon.

**Leucadendron venosum** R. Br. in Trans. Linn. Soc. 10, 59 (1811) ; Phill. & Hutch. in Fl. Cap. 5, I. 720 (1912).

There are two specimens in the Kuntze collection named *Protea conchiformis*, the type from Sir Lowry's Pass, 200 m. alt., 20-I-1894, and the other from 350 m. alt. 22-I-1894. The latter appears to be *Leucadendron grandiflorum* R. Br. but no fruit is available to confirm this suggestion.

*Protea xanthoconus* O. Kuntze, p. 278.—Cape Province ; Caledon.

**Leucadendron salignum** B. Br. in Trans. Linn. Soc. 10, 62 (1811).

*L. xanthoconus* (O. Kuntze), K. Schum. in Just. Jahresb. 26, I. 364.

It is suggested in Fl. Cap. 5, I. 721, that the Kuntze specimen is equal to either *L. uliginosum* R. Br. or *L. salignum* R. Br. No male flowers are present on the Kuntze type and it is difficult to decide to which of these two species it should be referred. It agrees well, however, with a specimen collected in the same district, namely Caledon, by T. J. Stokoe, which has a glabrous male perianth-tube and which agrees closely in other essential respects with *L. salignum*.

*Scolymocephalus lanuginosus* O. Kuntze, p. 279.—Natal ; Van Reenen's Pass.

**Protea Rouppelliae** Meisn. in DC. Prod. 14, 237 (1856) ; Phill. & Stapf in Fl. Cap. 1. c. 573 (1912).

#### THYMELAEACEAE.

(With the assistance of M. Moss.)

**Gnidia Kuntzei** Gilg ex O. Kuntze, p. 280.—Cape Province ; Middelburg Road.

C. H. Wright in Fl. Cap. 5, 2. 70 (1915) cites *G. Kuntzei* Gilg as a synonym of *Lasiosiphon microphyllus* Meisn., but the type of the latter, a Drège specimen, was collected near the mouth of the Orange River in the Richtersveld and is now considered specifically distinct from the Kuntze specimen and others cited by Wright, 1. c., from the Middelburg and adjacent districts.



*Gnidia phaeotricha* Gilg ex O. Kuntze, p. 281.—Natal; Van Reenen's Pass.

**G. gymnostachya** (C. A. Mey.) Gilg var. **phaeotricha** M. Moss comb. nov.

*Arthrosolen phaeotrichus* (Gilg) C. H. Wright, l. c. 8.

The type of *Gnidia phaeotricha* is without flowers but a comparison of it with several authentically named specimens supports the above classification.

*Gnidia polyclada* Gilg ex O. Kuntze, p. 281.—Cape Province; Aliwal North.

**Arthrosolen polycephalus** (E. Mey.) C. A. Mey. in Bull. Phys. Math. Acad. Petersb. I. 359 (1845); Wright, l. c. 4.

*Gnidia pretoriae* Gilg ex O. Kuntze, p. 281.—Transvaal; Pretoria.

**Gnidia sericocephala** (Meisn.) M. Moss, comb. nov.

*Arthrosolen sericocephalus* Meisn. in DC. Prod. 14, 561 (1857); Wright, l. c. 5.

#### EUPHORBIACEAE.

*Claoxylum* ? *sphaerocarpum* O. Kuntze, p. 284.—Natal; Clairmont.

**Croton sylvaticus** Hochst. ex Krauss in Flora 1845, 82; Prain in Fl. Cap. 5, 2. 413 (1920).

*Euphorbia laxiflora* O. Kuntze, p. 286.—Cape Province; East London.

**E. bubalina** Boiss. Cent. Euphorb. 26, and in DC. Prodr. 15, 2. 90 (1862); N.E.Br. in Fl. Cap. 5, 2. 335 (1915).

**Jatropha Woodii** O. Kuntze, p. 287; Prain l. c. 425—Natal; Ladysmith.

*Ricinocarpus depressinervius* O. Kuntze, p. 291.—Natal; Mooi River Station.

**Acalypha depressinervius** (O. Kuntze) K. Schum. in Just. Jaresbr. 26, I. 348; Prain l. c. 479.

**Sapium Simii** O. Kuntze, p. 293; Prain l. c. 514.—Cape Province; Pirie.

*Tragia Bolusii* O. Kuntze, p. 293.—East Griqualand; Clydesdale.

**T. Meyeriana** Müll. Arg. in DC. Prodr. 15, 2. 938 (1866); Prain l. c. 508.

**Tragia durbanensis** O. Kuntze, p. 293; Prain l. c. 510—Natal; Durban, Bluff.

#### IRIDACEAE.

**Gladiolus pretoriensis** O. Kuntze, p. 308.—Transvaal; Pretoria.

*Gladiolus tritoniaeformis* O. Kuntze, p. 308.—Natal; Howick.

**G. crassifolius** Baker in Journ. Bot. 1876, 334.

Identification by G. J. Lewis.

#### AMARYLLIDACEAE.

*Hessea Schlechteri* O. Kuntze, p. 310.—Natal; Mooi River.

**Nerine pancratioides** Baker in Gard. Chron. 1891, 576.

*N. Schlechteri* Baker sp. nov. in Bull. Herb. Boiss. ser. 2, 3. 665 (1903).

Identification by W. F. Barker.

## LILIACEAE.

*Aloe cascadiensis* O. Kuntze, p. 313.—Cape Province ; East London.

**A. striatula** Haw. in Phil. Mag. 1825, 281.

This identification is suggested by Berger in Das Pflanzenf. 1908, 261. G. W. Reynolds who examined the type (which is very poor) qualified his agreement by stating that he did not know *A. striatula* from near East London but only in the mountains further inland.

**Aloe transvaalensis** O. Kuntze (*transvalensis*) p. 314 ; Berger l.c., ; Transvaal ; Pretoria.

**Asparagus spinosissimus** O. Kuntze, p. 315.—Cape Province ; Cathcart.

This is matched by *Galpin* 2095 from near Queenstown. It is closely allied to *A. suaveolens* Burch.

*Phalangium tenuifolium* O. Kuntze, p. 317.—Cape Province ; Caledon.

**Bulbine tenuifolia** Baker ex O. Kuntze l.c.

The type specimen is very poor ; the inflorescence has been reduced to a few young buds. It was not matched in the Nat. Herb. Pretoria.

## RESTIACEAE.

*Thamnochordus maximus* O. Kuntze, p. 330.—Cape Province ; near Cape Town.

**Thamnochortus spicigerus** (Thunb.) R.Br. Prod. 224 (1810) ; N. S. Pillans in Trans. Roy. Soc. 16, 383 (1928).





# SOUTH AFRICAN ASCOMYCETES IN THE NATIONAL HERBARIUM.

By Ethel M. Doidge.

## PART V.

During recent years, a number of South African fungi have been studied critically by workers in Europe, and detailed descriptions published in the *Annales Mycologici* and elsewhere; in many cases changes in nomenclature have been made. It seems desirable that this work should be readily available to South African mycologists, and an indication given of the material of such fungi which is available for study.

In the present paper, descriptions are given of a number of fungi which have been studied in this way, the descriptions being translated freely and adapted from the work quoted in each case. A number of original descriptions of fungi apparently undescribed or hitherto unrecorded from South Africa, are also included. I am indebted to Dr. H. Sydow for help with some of the critical species, and especially for comparing South African material with types available in Europe.

The last paper of this series was Part IV, published in *Bothalia* Vol. 2 (1927) pp. 229-241; it included descriptions of ascomycetes numbered 136-159.

### 160. *Irene Ekebergiae* Doidge nov. sp.

Plagulae amphigenae, sparsae, orbiculares v. irregulares, 1-2 mm. diam.; mycelium reticulatum ex hyphis undulatis, fuscis usque brunneis, 7.5-10  $\mu$  latis, septatis (articulis 12-35  $\mu$  longis) oppositè ramosis compositum; hyphopodia capitata alternata, recta, curvata v. uncinata, 15-35  $\mu$  longa, cellula basali cylindracea v. gibbosa, 5-12.5  $\mu$  longa, cellula superiore clavata, cylindracea v. irregulare, saepe sublobata, 10-17.5  $\mu$  lata; hyphopodia mucronata numerosa, plerumque opposita, haud pallidiores, 20-25  $\mu$  longa, ampullacea, e basi ventricosò-dilatata, 8-10  $\mu$  lata, subito in collum longiusculum rectum, obliquum v. curvatum 3-4  $\mu$  latum attenuata; perithecia sparsa, globosa, atra, 120-160  $\mu$  diam., cellulis parietis convexis; asci non visi; sporae ellipsoideae, 4-septatae, brunneae, utrinque rotundatae, constrictae, 47-58  $\times$  22-27.5  $\mu$ .

Hab. in foliis *Ekebergiae pterophyllae* Hofmeyr, Lydenburg, leg. Keet, 28909.

Colonies amphigenous, scattered, isolated or subconfluent, often more numerous on the lower surface of the leaf, dense, black, small, round to irregular in outline, 1-2 mm. diam. Mycelium reticulate, often forming a dense network, especially near the centre of the colony. Hyphae undulating to tortuous, at first pale fuscous, soon becoming fuscous, and older hyphae are dark reddish brown [Natal brown (\*Ridgway)]; hyphae 7.5-10  $\mu$  thick, usually rather densely branched, cells 12-35  $\mu$  long; branches mostly opposite, less frequently irregular, anastomosing freely. Capitae hyphodia alternate or unilateral, fairly numerous, straight, curved or uncinata, 15-35  $\mu$  long; basal cell cylindrical or gibbous, straight or curved, 5-12.5  $\mu$  long, 6-10  $\mu$  thick; apical cell very variable in form, clavate, cylindrical or irregular, often sublobed, rounded or flattened at the apex, 10-17.5  $\mu$  broad. Mucronate

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\*Ridgway colour standards and nomenclature, Washington, 1912.

hyphopodia very numerous, especially near the centre of the colony, on separate branches or interspersed with the capitate hyphopodia, usually opposite, not paler than the hyphae, flask-shaped, 20–25  $\mu$  long, 8–10  $\mu$  thick at the swollen base, narrowing suddenly into a rather long neck, which is straight, oblique or curved and 3–4  $\mu$  thick. Perithecia (not mature) scattered, black, globose, 120–160  $\mu$  diam., outer wall composed of convex cells; the perithecia would probably be larger when mature. Asci not seen. Spores ellipsoid, 4-septate, broadly rounded at both ends, constricted at the septa, 47–58  $\mu$  long; central cell 22–27.5  $\mu$  broad, tapering slightly towards the ends.

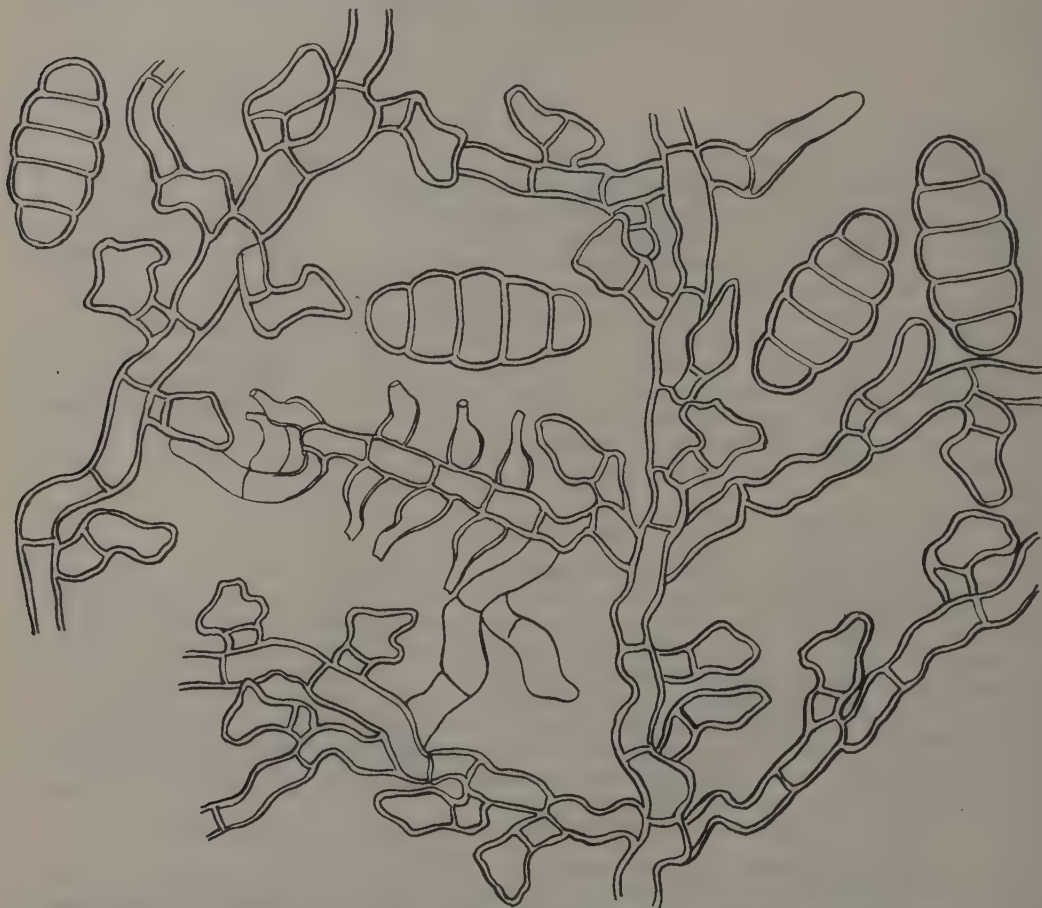


FIG. 1.—*Irene Elsebergiae*. Spores, and hyphae with capitate hyphopodia and mucronate hyphopodia.

On leaves of *Ekebergia pterophylla* Hofmeyr, Lydenburg, Transvaal, Keet, 28909.

161. *Meliola Acridocarp* Doidge nov. sp.

Plagulae semper epiphyllae, irregulariter sparsae, atrae, orbiculares v. plus minus irregulares, usque 4 mm. diam. Mycelium ex hyphis plus minus dense reticulato-ramosis, rectiusculis, septatis, pellucide brunneis, 7.5–8  $\mu$  crassis compositum. Hyphopodia capitata numerosa, alternantia, rarius unilateralia, 18.5–24  $\mu$  alta;

cellula basali cylindracea,  $3.75-6\ \mu$  longa et  $7.5-10$  lata; cellula apicali integra, ovata v. globulosa,  $12.5-15\ \mu$  diam. Hyphopodia mucronata numerosa, opposita v. alternantia, lageniformia,  $16-23\ \mu$  longa, in parte inferiore  $8.5-10\ \mu$  lata, sursum sensim vel e medio abrupte in collum attenuata. Setae myceliales nullae. Perithecia in centro plagarum aggregata, globosa, verrucosa, atra  $150-200\ \mu$  diam., pariete membranaceo e cellulis  $13-18\ \mu$  diam. irregulariter angulosus extus conico-prominulis composito. Setae peritheciales paucae (5-12) sat rigidae, septatae,  $75-100\ \mu$  longa, inferne brunneae, subopaeae,  $10-12\ \mu$  crassae, sursum sensim leniterque attenuatae et dilutiores, ad apicem scabrae, rectae v. uncinatae,  $5-6.5\ \mu$  crassae. Asci 2-3-spori ovati v. ellipsoideae.  $60-65 \times 17.5-25\ \mu$ , saepe diffluentes. Sporae oblongae, utrinque haud vel leniter tantum attenuatae, late rotundatae, leniter constrictae, pellucide brunneae,  $40-45 \times 15-16\ \mu$ .

Hab. in foliis *Acridocarpi natalitii* Juss., Oribi Gorge, prope Port Shepstone, leg. *McClean*, 31054.

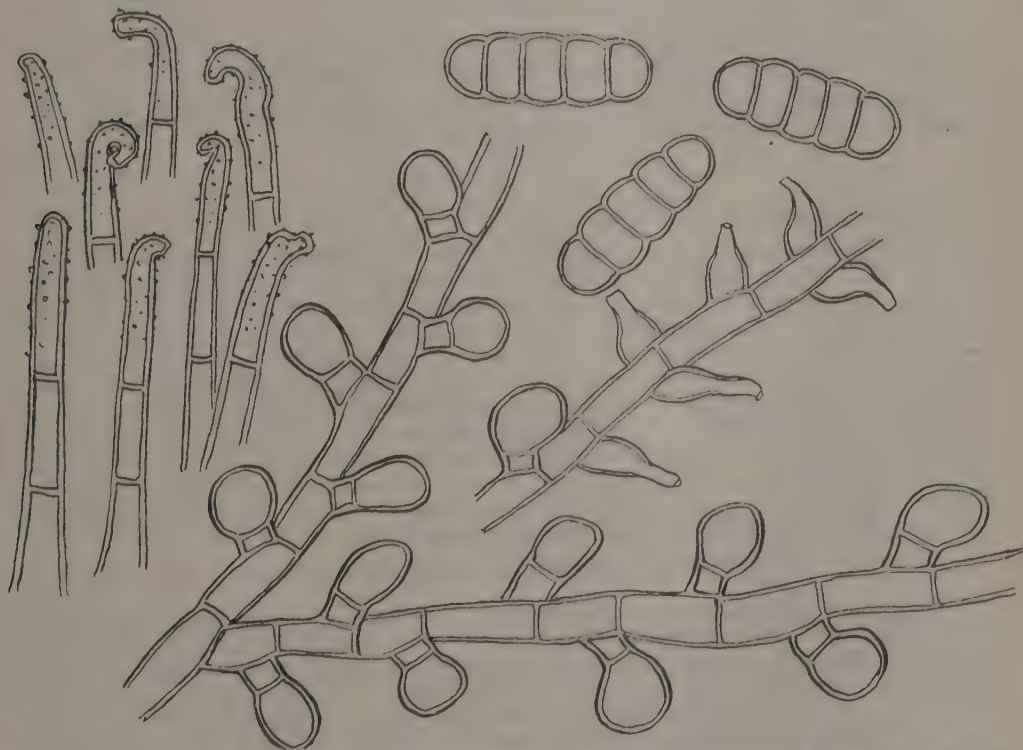


FIG. 2.—*M. Acridocarpi*. Spores, tips of perithecial setae, and hyphae with capitate and mucronate hyphopodia.

Colonies epiphyllous, scattered, more or less circular or irregular, up to 4 mm. diam., dense, dull black. Mycelium more or less closely reticulate, brown (tawny olive to sayal brown or snuff brown, Ridgway) pellucid. Hyphae usually straight, mostly  $7.5-8\ \mu$  thick, rarely up to  $10\ \mu$ , with cells  $15-20\ \mu$  long, branching freely; branches opposite or irregular. Capitate hyphopodia alternate or unilateral; often rather regularly alternate, one to each cell of the hypha, but more or less irregular where the mycelium is closely reticulate; mostly inclined forward at an angle of ca.  $45^\circ$  with the hyphae,  $18.5-24\ \mu$  long; basal cell short, cylindrical,  $3.75-6\ \mu$  long and  $7.5-10\ \mu$  broad; apical cell sub-globose to ovate, entire,



12.5–15  $\mu$  diam., rarely flattened or irregular through contact with neighbouring hyphopodia or hyphae. Mucronate hyphopodia numerous, on separate short branches or interspersed with the capitate hyphopodia, not paler than the hyphae, opposite or alternate, lageniform, 16–23  $\mu$  long, 8.5–10  $\mu$  broad at the base, narrowing suddenly or rather gradually into a neck which is more or less curved, rarely straight, about half the total length of the hyphopodium and 3.5–4  $\mu$  thick. Mycelial setae none. Perithecia closely crowded in the centre of the colony, black, carbonaceous, globose, verrucose, 150–200  $\mu$  diam.; wall membranous, formed of cells 13–18  $\mu$  diam., more or less angular, convex or conical at the surface. Perithecial setae 5–12, rigid, septate, 3–4-celled, 75–100  $\mu$  long, dark brown, sub-opaque, 10–12  $\mu$  thick at the base, tapering somewhat to the apex which is lighter brown, pellucid, obtusely rounded, 5–6.5  $\mu$  thick, straight, bent or uncinat; apical cell scabrous. Asci 2–3-spored, ellipsoid or ovate, rounded above, sessile or sub-pedicellate, 60–65  $\times$  17.5–25  $\mu$ , evanescent. Spores 4-septate, oblong, more or less constricted at the septa, not tapering, or tapering very slightly to broadly rounded ends, mostly 40–45  $\times$  15–16  $\mu$ , rarely up to 47.5  $\mu$  long and 17.5  $\mu$  broad.

on leaves of *Acridocarpus natalitius* Juss., Oribi Gorge, near Port Shepstone, Natal, McClean, 31054; Inanda, Natal, Medley Wood 575, 9514, 10357.

Closely related to *Meliola claviculata* Doidge, from which it differs in habit, the opaque perithecia, the septate perithecial setae and longer spores.

#### 162. *Meliola Impatientis* Doidge nov. sp.

Plagulae amphigenae, plerumque epiphyllae, atrae, minutae, irregulares v. orbiculares, usque 2.5  $\mu$  diam.; mycelium ex hyphis fuscis, undulatis, 6–8  $\mu$  latis, septatis (articulis 15–25  $\mu$  longis) laxè ramosis compositum; hyphopodia capitata numerosa, alternantia, 17–23  $\mu$  longa, cellula basali cylindræa, 4–6  $\mu$  longa, superiore subglobose, plus minus lobata v. truncata, latiore quam longa, 12–17.5  $\mu$  lata; hyphopodia mucronata sat numerosa, plerumque in centro plagarum evoluta, opposita v. alternata, ampullæa, collo brevi recto v. curvato, 20–25  $\mu$  longa, basi 6–8  $\mu$  lata; setae myceliales sat numerosae, praecipue juxta perithecia evolutae, simplices, ad basim geniculatae, rectae v. leniter incurvae, 250–350  $\mu$  longae, basi atro-brunneae, subopacae, 8–9  $\mu$  crassae, sursum ad apicem obtusum v. sub-acutum subpellucidem sensim attenuatae; perithecia sparsa, atra, subglobose, 160–220  $\mu$ , daim., cellulis parietis convexis; ad septa 2–4 spori, fugaces; sporae brunneae, cylindræae utrinque rotundatae, 4-septatae, ad septa leniter constrictae, 35–40  $\times$  12–15  $\mu$ .

Hab. in foliis *Impatientis capensis* Meerb., Woodbush, leg. Morgan et Doidge, 28348.

Colonies amphigenous, mostly epiphyllous, discrete or subconfluent, minute, rather thin, black, round to irregular in outline and up to 2.5 mm. in diameter. Mycelium radiating or loosely reticulate. Hyphae pale fuscous to olive brown, more or less undulating, 6–8  $\mu$  thick, cells 15–25  $\mu$  long; branches distant, usually alternate. Capitate hyphopodia numerous, alternate or unilateral, 17–23  $\mu$  long, mostly at an angle of about 45° with the hyphae; basal cell cylindrical 6–8  $\mu$  thick, usually 4–6  $\mu$  long, very rarely up to 15  $\mu$  long; apical cell subglobose to irregular, often bluntly angular, truncate or with 2–3 shallow, rounded lobes, often broader than long, 12–17.5  $\mu$  broad. Mucronate hyphopodia numerous in the older part of the colony, produced on special hyphal branches, opposite or alternate, paler than the hyphae, ampulliform, 20–25  $\mu$  long, 6–8  $\mu$  diameter at the base, tapering rather gradually into a short neck which is straight or curved. Mycelial setae produced mostly in the neighbourhood of the perithecia, fairly numerous, simple, geniculate near the base, straight or slightly incurved, 250–300  $\mu$  long; dark brown, subopaque and 8–9  $\mu$  thick at the base, tapering gradually towards the apex which is somewhat paler, pellucid, obtuse or occasionally subacute. Perithecia scattered, black, globose, 160–220  $\mu$  diam., cells of the outer wall convex. Asci 2–4-spored, disappearing early. Spores olive brown, cylindrical, 4-septate, slightly constricted, broadly rounded at both ends.



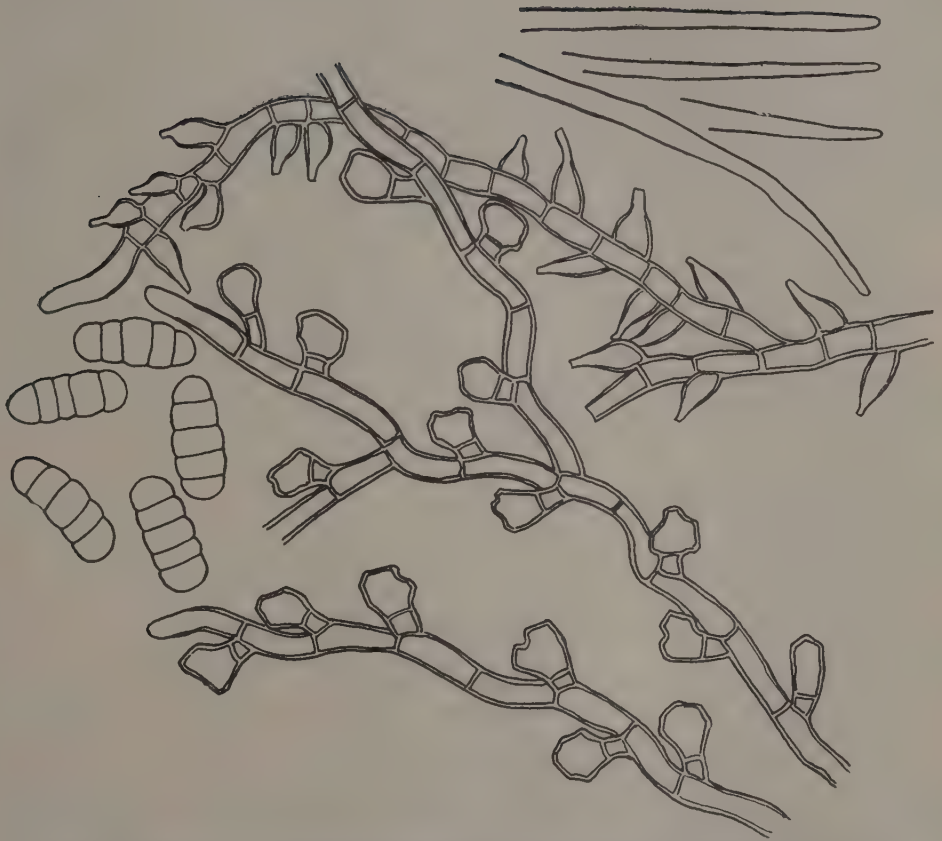


FIG. 3.—Spores, tips of mycelial setae, and hyphae with capitate and mucronate hyphopodia.

On leaves of *Impatiens capensis* Meerb., Woodbush, Pietersburg District, Transvaal, Morgan and Doidge, 28348.

163. *Meliola jasminicola* P. Henn.

Hedwigia 34 (1895) p. 11; Stevens, Ann. Myc. 26 (1928) p. 257.

Colonies amphigenous, mostly epiphyllous, also on the petioles, not causing leaf spots, irregularly scattered, dull black, more or less round, 1–3 mm. diam.; when numerous becoming confluent and forming larger, irregular blotches. Mycelium more or less reticulate, rather densely so in the older part of the colony, composed of cinnamon brown hyphae which are straight or somewhat undulating, mostly 7–8  $\mu$  thick, in places up to 10  $\mu$ ; cells mostly 20–30  $\mu$  long; branches fairly numerous, mostly opposite and at an acute angle with the main hyphae. Capitate hyphopodia numerous, alternate, unilateral or opposite,

2-celled, broadly clavate, rarely cylindrical, straight or slightly curved, mostly inclined forward towards the hypha, 17–23  $\mu$  long; basal cell cylindrical, 5–8  $\mu$  long, 7–8  $\mu$  broad; apical cell ovate to cylindrical, entire, broadly rounded above, 9–10  $\mu$  broad. Mucronate hyphopodia numerous in the older parts of the colony, on separate hyphal branches or interspersed with the capitate hyphopodia, usually opposite, not paler than the hyphae, flask-shaped, 17–20  $\mu$  long, 7–8  $\mu$  broad at the base, narrowing suddenly or rather gradually into a curved or oblique neck, about equal in length to the swollen base and 2.5–3.5  $\mu$  thick. Mycelial setae not very numerous, scattered, but more numerous in the neighbourhood of the perithecia, simple, straight, 400–600  $\mu$  long; opaque, black, 8–12  $\mu$  thick at the base, tapering gradually upwards to the dark brown, somewhat translucent apex. Perithecia not numerous, grouped in the centre of the colony, black, globose, carbonaceous, surface cells slightly convex, 240–300  $\mu$  diam., Asci 2-spored, evanescent. Spores 4-septate, cylindrical, not tapering, or tapering slightly to broadly rounded ends, constricted at the septa, 35–50  $\times$  12.5–17.5  $\mu$ ; central cell usually slightly longer.

On leaves of *Jasminum streptopus* E. Mey., Springfield, Natal. *Medley Wood*, 31050.

This fungus was compared with a specimen of *M. jasmnicola* collected by Merrill in the Philippines (Flora Philip. No. 7469) and identified by Sydow; it appears to be identical.

The spores are very variable in size; in the original description the measurements given are 30–36  $\times$  10–15  $\mu$ , and Stevens' group number (l.c.) 3111·3233 indicates that spores are 40  $\mu$  long or less. In the Philippine specimen examined, as well as in the South African collection they were frequently 40–45  $\times$  15  $\mu$ , and in the South African material spores up to 50  $\mu$  long were not uncommon.

164. *Meliola oleicola* Doidge var. *Jasmini* n. var.

*Bothalia* 2 (1928) p. 458.

A typo recedit hyphodiis (usque 25  $\mu$  longis) et sporidiis (35–40  $\times$  15–18  $\mu$  raro usque 42.5  $\mu$  longis) minoribus.

Hab. in foliis *Jasmini streptopi* E. Mey., Durban, leg. *Bottomley* 11379.

165. *Meliola perpusilla* Syd. var. *congoensis* Beeli.

*Bull. Jard. Bot. Etat Bruxelles* 7 (1920) p. 97; *Sacc. Syll. Fung.* XXIV (1926) pp. 271, 272.

Colonies mostly epiphyllous, less frequently hypophyllous or caulicolous, scattered, small, up to 2 mm. diam., black, more or less circular, or when crowded becoming confluent. Mycelium radiating, tawny olive (Ridgway); hyphae 7.5–10  $\mu$  thick, straight or very slightly undulating; branching remote, usually opposite, cells 20–30  $\mu$  long. Capitate hyphopodia alternate or unilateral, cylindrical to sub-clavate, inclined forwards towards the hypha, mostly at an angle of ca. 45°, 17–25  $\mu$  long; basal cell short, cylindrical, 2–6  $\mu$  long, 7–9  $\mu$  broad; apical cell ovate, rounded above, 15–17  $\mu$  long and 9–10  $\mu$  broad. Mucronate hyphopodia not numerous, usually opposite, lageniform, 12–15  $\mu$  long, 7–8  $\mu$  broad at the base, narrowed above into a short neck ca. 4  $\mu$  thick. Mycelial setae not very numerous, straight or slightly curved, simple, 200–400  $\mu$  long, dark brown, sub-opaque, 8–10  $\mu$  thick at the base, tapering gradually upwards to the paler, translucent, subacute apex. Perithecia scattered, black, globose, 150–200  $\mu$  diam., surface cells slightly convex, Asci ovate, 2–4-spored, 40–50  $\times$  25–30  $\mu$ . Spores oblong, broadly rounded at both ends, 4-septate, slightly constricted at the septa, olive brown, 35–40  $\times$  12.5–16  $\mu$ .

on leaves of *Secamone frutescens* Decne., Karkloof, near Maritzburg, Natal, *Doidge*, 14958.

On comparison with a specimen of *Meliola perpusilla* Std. (No. 11423 in Baker's *Fungi Malayana*, det. Saccardo) the South African fungus was found to differ in the size of the perithecia and spores; these agreed in measurement with those of Beeli's var. *congoensis*.

166. *Meliola Ptaeroxyli* Doidge, nov. sp.

Plagulae amphigenae, irregulariter sparsae, orbiculares v. plus minus irregulares, atrae, usque 4 mm. diam.; mycelium ex hyphis fuscis rectiusculis ramosis,  $7.5\text{--}12.5\ \mu$  crassis, breviter articulatis, torulosis compositum. Hyphopodia capitata numerosa, unilateralia v. alternantia, irregularia,  $20\text{--}40\ \mu$  longa; cellula basali plerumque cylindracea,  $5\text{--}12.5\ \mu$  longa et  $6\text{--}9\ \mu$  lata; apicali cylindracea, ovata, clavata vel irregulariter 2-3-lobata, recta v. curvata,  $10\text{--}18\ \mu$  lata. Hyphopodia mucronata saepe numerosa, variabilia,  $20\text{--}27.5\ \mu$  longa, in parte infera  $7.5\text{--}10\ \mu$  lata, e medio plerumque subito in collum cylindraceum, rectum obliquum v. curvatum transeuntia. Setae myceliales sat numerosae, rectae vel subrectae, usque  $750\ \mu$  longae, ad basim  $8\text{--}10\ \mu$  latae opace atrobrunneae, apicem versus sensim attenuatae et dilutiores, ad apicem obtusae, sub-acutae v. nonnunquam minute bi-denticulatae. Perithecia sparsa vel pauca aggregata, globosa, atra,  $180\text{--}300\ \mu$  diam., verrucosa. Asci ovati, facile diffluentes, 2-3-spори. Sporae oblongae, 4-septatae, utrinque leniter attenuatae, late rotundatae,  $50\text{--}60 \times 20\text{--}23\ \mu$ .

Hab. in foliis *Ptaeroxyli obliqui* (Thun.) Radkb., in silvis Marwaqa, prope Bulwer, Natal, leg. Morgan et Doidge 30899.

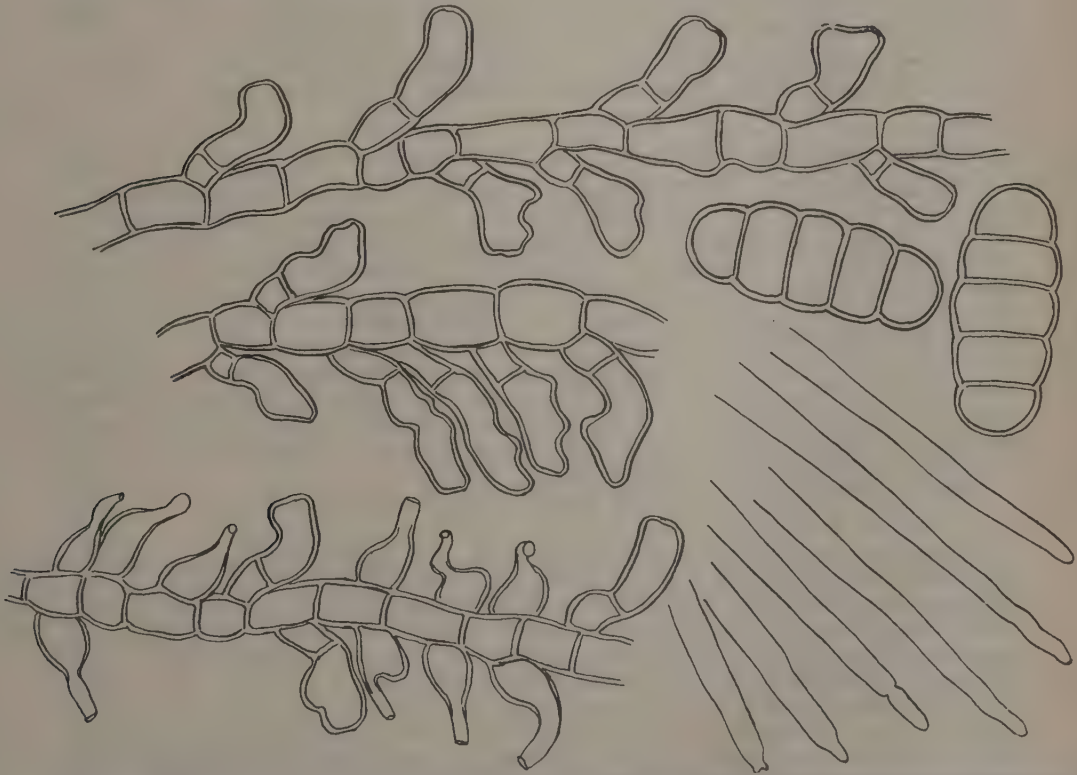


FIG. 4.—*Meliola Ptaeroxyli*. Spores, tips of mycelial setae, and hyphae with capitata and mucronate hyphopodia.

Colonies amphigenous, scattered, on indefinite brownish leaf spots, up to 4 mm. diam. Mycelium radiating, formed of tawny olive (Ridgway) hyphae, which are usually straight, torulose,  $7.5\text{--}12.5\ \mu$  thick, with very short cells  $7.5\text{--}12.5\ \mu$  long, often constricted at the septa; freely branched, branches often opposite. Capitata hyphopodia unilateral or



alternate, irregular in form and size, straight or sinuous, 20–40  $\mu$  long; near the centre of the colony often closely crowded, with series of 3–5 or more on one side of the hypha; nearer the margin often more regularly alternate, and on some branches distant; usually inclined forward, forming an acute angle with the hypha; basal cell usually more or less cylindrical, straight or bent, rarely irregular, 5–12.5  $\mu$  long, usually 6–9  $\mu$  broad, rarely ventricose and up to 12.5  $\mu$ ; apical cell cylindrical, ovate, clavate, or sub-lobed and irregular in outline, rounded or truncate at the apex, straight, curved or bent, entire or with 2–3 obtuse shallow lobes, 10–18  $\mu$  broad. Mucronate hyphopodia numerous in some colonies, interspersed with the capitate hyphopodia, mostly opposite, but occasionally alternate or unilateral, not paler than the hyphae, lageniform, straight, gibbous or curved, 20–27.5  $\mu$  long, 7.5–10  $\mu$  broad at the more or less swollen base, constricted into a neck about half the entire length of the hyphopodium and ca. 3.5  $\mu$  thick, direct or oblique, more or less curved. Setae fairly numerous, straight, up to 750  $\mu$  long; blackish brown, opaque, 8–10  $\mu$  thick at the base; tapering upwards to the apex, which is brown, more or less pellucid, 2.5–4  $\mu$  thick, simple, rounded or sub-acute, frequently constricted or sub-torulose near the tip and occasionally minutely bidentate. Perithecia not very numerous, scattered or more or less grouped, black, globose, 180–300  $\mu$  diam.; surface cells strongly convex, 15–25  $\mu$  diam. Asci 2–3-spored, ovate. Spores 4-septate, oblong, constricted at the septa, tapering slightly to broadly rounded ends, 50–60  $\times$  20–23  $\mu$ .

on leaves of *Ptaeroxylon obliquum* (Thunb.) Radkl., Marwaga Forest near Bulwer, Natal, *Morgan and Doidge*, 30899; Buccleuch, near Maritzburg, Natal, *Doidge*, 9715.

167. *Meliola xumenensis* Doidge nov. sp.

Plagulae epiphyllae, dispersae, tenues, atro-griseae, irregulares v. orbiculares usque 3 mm. diam. Mycelium laxe reticulatum ex hyphis ramosis, plus minus undulatis, septatis, olivaceo-brunneis, plerumque 6–8  $\mu$  latis compositum. Hyphopodia capitata modice copiosa, alternantia v. unilaterialia, 27.5–45  $\mu$  alta; cellula basali cylindracea, variae longitudinis, 6–12  $\mu$  longa et 7–7.5  $\mu$  lata; cellula apicali cylindracea, uncinata v. sinuosa, rarissime recta, 10–12.5  $\mu$  lata, vel irregulariter 2–3-lobata, 20–23  $\mu$  lata. Hyphopodia mucronata plerumque opposita, haud pallidiores, 20–25  $\mu$  longa, parte infera 6–9  $\mu$  lata, e medio sensim, raro subito in collum tenuiorem transeuntia. Setae myceliales simplices, rectae, v. sub-rectae, 300–600  $\mu$  longae; ad basim 6–9  $\mu$  crassae, atrae opacae, apicem brunneum sub-pellucidum versus sensim attenuatae. Perithecia laxa aggregata, globosa, atra, scabra, 180–200  $\mu$  diam. Asci 2-sporei. Sporae 4-septatae, cylindraceae utrinque late rotundatae, ad septa leniter constrictae, 45–50  $\times$  17–19  $\mu$ .

Hab. in foliis *Jasmini streptopii* E. Mey., in silvis Xumeni, prope Donnybrook, Natal, leg. *Morgan et Doidge*, 29897.

Colonies epiphyllous, not on leaf spots, scattered, thin, greyish black, round to irregular in outline, poorly defined, up to about 3 mm. diam. Mycelium loosely reticulate; hyphae light brownish olive (Ridgway) more or less undulating, uneven in thickness, mostly 6–8  $\mu$  thick but up to 10  $\mu$  thick in places; cells mostly 25–40  $\mu$  long; branching rather remote opposite or alternate. Capitate hyphopodia fairly numerous, rather remote, alternate or unilateral, inclined forward towards the hypha or erect, 2-celled, 27.5–45  $\mu$  high; basal cell more or less cylindrical, 6–12.5  $\mu$  long, 7–7.5  $\mu$  broad; apical cell cylindrical to clavate with broadly rounded or truncate apex, curved, more or less uncinuate or sinuous, abruptly bent, or rarely almost straight, 10–12.5  $\mu$  broad, or irregular with 2–3 rounded, rather shallow lobes and 20–23  $\mu$  broad. Mucronate hyphopodia fairly numerous in the older parts of the colony, on separate short branches or interspersed with the capitate hyphopodia, usually opposite, not paler than the hyphae, straight or slightly curved, 20–25  $\mu$  high 6–9  $\mu$  broad at the base, tapering gradually into a neck which is 3–4  $\mu$  thick at the apex, rarely constricted abruptly at the centre. Mycelial setae not very plentiful, more numerous round the base of the perithecia, simple, straight or slightly curved, 300–600  $\mu$  long; black, opaque, 7.5–9  $\mu$  thick at the base; tapering gradually upwards to the brown, more or less translucent



apex, which is rounded and usually ca.  $3.5-4\ \mu$  thick. Perithecia fairly numerous, more or less grouped near the centre of the colony, black, globose, scabrous,  $180-200\ \mu$  diam. Asci 2-spored, evanescent. Spores 4-septate, cylindrical, concolorous with the mycelium, broadly rounded at the ends, slightly constricted at the septa,  $45-50 \times 17-19\ \mu$ .

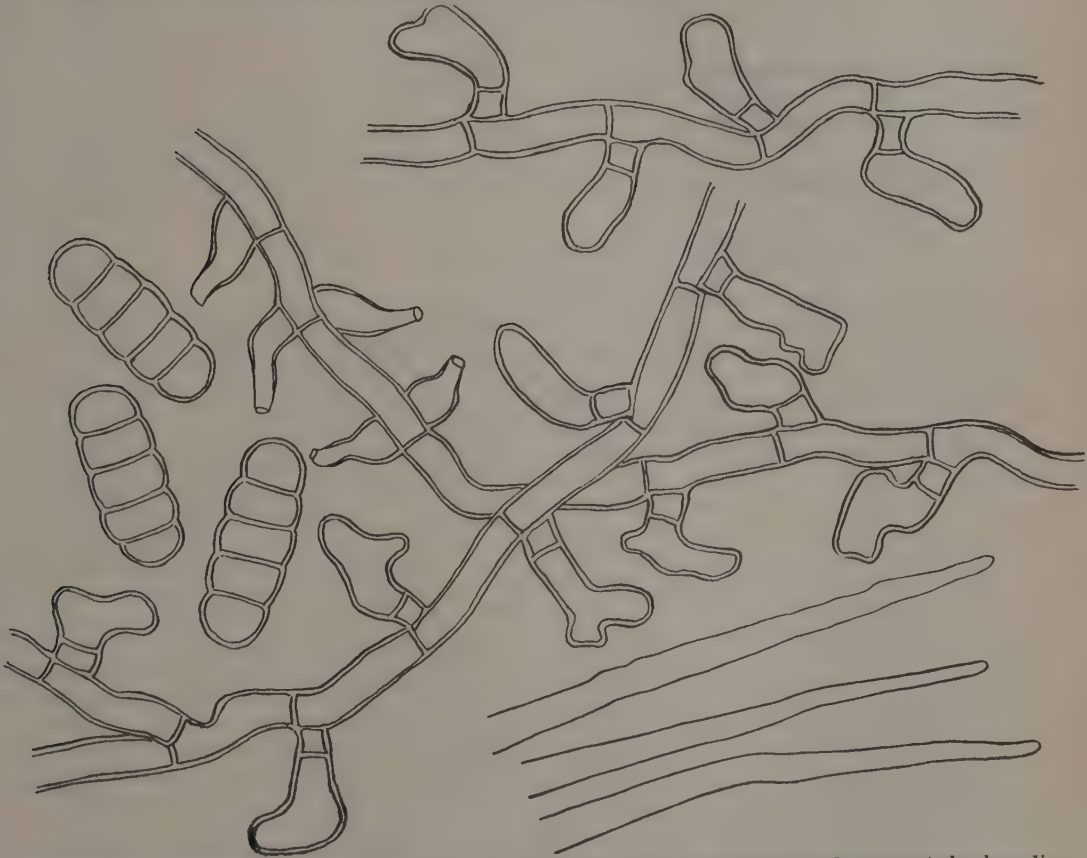


FIG. 5.—*Meliola Xumenensis*. Spores, tips of mycelial setae, and hyphae with capitate and mucronate hyphopodia.

on leaves of *Jasminum streptopus* E. Mey., Xumeni Forest, near Donnybrook, Morgan and Doidge, 29897; Karkloof, near Maritzburg, Doidge 14942.

In collection 29897, associated with *Meliola gemellipoda*, the latter occurring mostly on the stems.

168. *Meliola rhoina* Doidge.

Bothalia 2 (1928) p. 454.

on leaves of *Harpephyllum caffrum* Burch., East London, Doidge, 10926; Howieson's Poort, near Grahamstown, Doidge, 10958; Pirie Forest, Kingwilliamstown, Doidge, 12269, 22396; Marwaqa Forest near Bulwer, Morgan and Doidge 31899.

The *Meliola* sp. on *Harpephyllum caffrum* was not mentioned in the revision of the genus in *Bothalia* (loc. cit.) as its identity was doubtful. A careful study has now been made of a number of collections, and this fungus cannot be distinguished from *Meliola rhoina*, which is a very variable species.

In addition to the occurrences of *Meliola rhoina* on *Rhus* spp. previously recorded, it has been found on:—

*Rhus MacOwani* Schonl., Alexandria Forest, Doidge 22372;

*Rhus natalensis* Bernh., East London, Doidge, 22389.

169. *Physalosporina Sutherlandiae* (Kalch. et Cke.) Petrak  
in Ann. Myc. 32 (1934) p. 411.

Syn. *Stigmataea Sutherlandiae* Kalch. et Cke. in Grevillea 9 (1880) 32; Syll. Fung. 1 (1882) 543.

*Stigmatula Sutherlandiae* (Kalch. et Cke.) Syd. in Bull. Herb. Boiss. 2, ser. 1 (1901) 78;  
Syll. Fung. 16 (1902) 454.

*Hyponectria Sutherlandiae* (Kalch. et Cke.) Theiss.  
in Verhandl. Zool. Bot. Ges. 69 (1920) 23.

Stroma extensive, usually spreading from the margins or the tips of the leaves, which show a yellowish or light yellowish-brown discoloration, and permeating the entire mesophyll at the leaf. Ground tissue of the stroma almost sclerotial in character, consisting of loose plectenchyma, formed of tortuous and interwoven hyphae which are very freely branched, rather closely septate, 3–6  $\mu$  thick, hyaline and comparatively thick-walled. Stromatal tissue developed most freely in the palisade cells, often interrupted by small irregular spaces and including shrunken vestiges of the substratum. Perithecia irregularly scattered, usually single; sometimes 2 or more, which are in close proximity become more or less confluent and form small, irregular groups; deeply immersed in the mesophyll, with a flat or slightly convex base seated on the flattened spongy parenchyma or slightly immersed in it; subglobose, ovate, slightly compressed, 200–300  $\mu$  diam. Ostioles short, thick, conical, punctiform-erumpent, about 80  $\mu$  high, traversed by a pore 20–30  $\mu$  broad, lined within with filamentous periphyses. Perithecial wall membranous to fleshy, usually 12–20  $\mu$  thick, composed of numerous layers of very strongly compressed cells, which are irregularly angular, thin-walled, 5–12  $\mu$  diam., hyaline or subhyaline in mass, becoming darker from the base of the ostiole to dark olive brown round the pore; fused outwardly with the tissue of the stroma and not sharply defined. Asci numerous, at first cylindrical, later more or less clavate or fusiform, broadly rounded above, tapering downwards into a short stalk, 8-spored, 60–75  $\times$  10–18  $\mu$ , with a thin delicate wall. Spores at first monostichous, then incompletely distichous, often transverse, broadly ellipsoid or ovate, broadly rounded at both ends, not tapering, straight, 1-celled, hyaline, 10–15  $\times$  7–9  $\mu$ . Paraphyses rather sparse, broadly filamentous, ca. 2–4  $\mu$  broad, very thin-walled, collapsing early and becoming mucilaginous and unrecognisable.

on dying leaves of *Sutherlandia frutescens* R. Br., Boschberg, near Somerset East, MacOwan 1415, 3684, 20846, 21978 (Rabh. Fung. Eur. 3344).

Petrak (loc. cit.) discusses at length the systematic position and synonymy of this fungus.

170. *Anthostomella Cassinopsidis* (K. et Cke.) Rehm.

Ann. Myc. 4 (1906) p. 341 and 5 (1907) p. 545, (erronee *A. Cassionopsidis*); Sacc. Syll. Fung. XXII (1913), p. 94.

Syn. *Diplodia cassinopsidis* Kalch. et Cke., Grevillea IX (1880), p. 19.

*Sphaeropsis Cassinopsidis* (Kalch. et Cke.) Pазsch., Rabh. Fung. Eur. 4488.

*Anthostomella Cassinopsidis* (Kalch. et Cke.) Petr. et Syd., Ann. Myc. 23 (1925) p. 216.

Perithecia more or less scattered, sometimes distant, sometimes close to one another, occasionally crowded; developing under the epidermis, which becomes raised, pustuliform,

with only the ostiole punctiform-erumpent; globose, black, very variable in size, usually ca. 300–500  $\mu$  diam., seldom somewhat larger; ostiole truncate-conical, traversed by a round pore. Perithecial wall mostly about 12–15  $\mu$  thick below; above it is fused with the outer wall of the epidermis, forming an epidermal clypeus which extends over and beyond the perithecium, and round its sides almost to the base; in this way the membrane at the sides becomes up to 75  $\mu$  thick, and when the perithecia are close together, these become fused and the single perithecia have the appearance of loculi sunk in a stroma. Asci cylindrical, thin-walled, broadly rounded above, tapering below into a rather short stalk, 8-spored, sp. part 100–120  $\times$  12–15  $\mu$ . Spores obliquely monostichous, elongate-ellipsoid or ovate, not tapering towards the broadly rounded ends or only slightly so, straight, rarely slightly curved, 1-celled, dark brown, almost opaque, 15–25  $\times$  8–12  $\mu$ . Paraphyses numerous, filamentous.

on stems of *Cassinopsis* sp., Cape, MacOwan, Rabenhorst-Pazschke, Fung. Europ. et extra-Europ. nr. 4488.

Rehm's species *Anthostomella Cassinopsidis* was described from a specimen collected by MacOwan and handed to him by Pazschke; his description agrees fairly well with that given by Petrak and Sydow of the fungus distributed by Pazschke as nr. 4488 of the Fungi europ. et extra-europ., and I think there is little doubt that it was part of the same collection.

In the *Annales Mycologici* 4 (1906) the name of the fungus was given as *An. Cassinopsidis* and the host *Cassinopsis* sp. So far as I am aware there is no such genus as *Cassinopsis*, and this was obviously a clerical error. The name of the host and the specific name of the fungus were given correctly in the *Sylloge Fungorum* (loc. cit.).

#### 171. *Mycosphaerella Aloes* Syd.

in Ann. Myc. 37 (1939) 181.

Stromata amphigenous, but mostly epiphyllous, round to elliptic or irregular in outline in groups 2–4 mm. diam., appearing first near the tip of the leaf, later spreading gradually and evenly downwards and becoming ever more numerous; the areas of the leaf which are invaded become dead and dark brown in colour. Stromata developing chiefly in the epidermis, sometimes consisting of a single, very thick-walled perithecium on a short, broadly truncate, inverted-conical basal stroma; but usually the stroma is tuberculate, irregularly circular or elliptic in outline, formed by the fusion of 2–3 perithecia, of which the more or less flattened apices break through cracks in the epidermis; they are more or less convex below and sunk into the mesophyll, usually 150–250  $\mu$  diam., seldom somewhat larger. At the base the stroma attains to a thickness of 80  $\mu$ ; it becomes gradually thinner at the sides and is often only 18–25  $\mu$  thick at the apex; it is parenchymatous and consists of cells which are irregularly polyhedral, thin-walled, translucent, blackish-brown, 6–12  $\mu$  diam., running out at the base and at the sides into rather short-celled tortuous hyphae 3–5  $\mu$  thick, which penetrate more deeply into the substratum.

Perithecia globose, broadly ovate or rather irregular, 120–180  $\mu$  diam., seldom somewhat larger, provided with a papilla, which is traversed by a rather indefinite irregular pore. Asci few, seldom more than six in a perithecium, 8-spored, broadly clavate, broadly rounded above, saccate below and then suddenly constricted, almost sessile, or with a very short, thick knob-like foot, 46–60  $\times$  14–22  $\mu$ . Spores more or less distichous, cylindrical, clavate or somewhat fusiform, obtusely rounded at both ends, not attenuate above or very slightly so, tapering gradually and more definitely below, straight or slightly bent, 1-septate, not constricted, hyaline, with thick episore, 17–23  $\times$  3.5–5  $\mu$ ; loculi equal or sub-equal. Paraphysoids rather numerous, indefinitely filamentous, erect, arising from the hyaline inner tissue of the perithecia, tardily becoming mucilaginous.

on dying apices of leaves of *Aloe lineata* Harv., Port Elizabeth, Doidge, 2293.



172. *Baumiella caespitosa* P. Henn.

in Bot. Ergebnisse der Kunene-Sambesi Exped. (1903) 165; Syll. Fung. 17, p. 708; v. Höhnelt, Fragmente zur Mykologie no. 618.

Syn. *Gibbera tinctoria* Mass., in Bull. Bot. Gard. Kew (1911) 226; Syll. Fung. 24, p. 923; Eyles in Rhod. Agr. Jour. 23 (1926) 642; Hopkins in Trans. Rhod. Sc. Ass. 35 (1938) 101.

Stromata epiphyllous, erumpent, closely crowded and covering the greater part of the leaf surface; (in Henning's type the stromata are in scattered, orbicular groups and the individual stromata not so closely crowded), black, round to irregular in outline, up to 1 mm. diam., verrucose or pulvinate, usually rough externally with irregular projections. The hypostroma consists of a parenchymatous tissue of very thin-walled, hyaline or yellow cells, very variable in form and size, often  $3-10\ \mu$  diam., rounded, angular, cylindrical or quite irregular, becoming almost hyaline and filamentous below, and becoming resolved into numerous hyphae which penetrate more deeply into the mesophyll of the leaf. After breaking out from the tissues of the host, the ground tissue of the stroma consists of thin-walled, translucent blackish-brown or greyish-brown, rounded or angular cells, mostly  $10-15\ \mu$  diam.; below and at the sides, the cells are often orientated in more or less vertical rows. The stroma is homogeneous without a firm outer crust, the outer layers of cells being very irregular and loosely compacted; it is rather more compact and smaller celled in the somewhat convex processes over the ostioles of the perithecia.

Loculi monostichous, one or few in each stroma, globose to ovate,  $120-160\ \mu$  diam., with very short truncate-conical ostioles, traversed by an indefinite pore; locular wall consisting of several layers of hyaline, much compressed cells, but not clearly defined. Asci briefly pedicellate, fusiform, straight or curved,  $112.5-135 \times 30-42.5\ \mu$ ; sp. part  $85-100\ \mu$  long, narrowed above into an apical beak traversed by a pore, apices of the asci converging towards the ostiole. Spores distichous or conglobate, hyaline, cylindrical, rarely sub-clavate, 1-septate, not constricted, rounded at both ends, mostly  $40-42.5 \times 10-11.5\ \mu$ , rarely  $35$  or  $47\ \mu$  long. Paraphysoids well developed, consisting of plates of cells almost entirely separating the asci.

on leaves of *Monotes glaber* Sprague, Salisbury, Eyles 1967, 14006.

Apart from the grouping of the stromata, the greatest difference between the fungus examined and the type, lies in the size of the spores. Hennings states that they are  $26-33 \times 9-13\ \mu$ ; Sydow in his study of a portion of the type specimen found this length to be correct, they were not longer than  $35\ \mu$ , but they were a little narrower. Von Höhnelt, however, (loc. cit.) after re-examining the type gives the following spore measurements:— $24-42 \times 7-9.5\ \mu$ ; it is possible that he examined a more mature piece of the material, and that the specimen described above is still better developed. Both Hennings and Von Höhnelt speak of 1- or 3-septate spores; 3-septate spores were not observed by Sydow in the type material nor in the specimen collected by Eyles. The latter must be regarded as a form of *Baumiella caespitosa* Henn. until further collections can be examined. The type was collected by Baum on leaves of *Monotes dasycantha* Gilg. near Quiriri, South West Africa (Baum 727, 1900).

Judging by the description, *Gibbera tinctoria* Mass. on *Monotes glaber* from Rhodesia, differs widely from *Baumiella caespitosa*; a portion of the type specimen was examined by Sydow, and he found this fungus identical with the *Baumiella* in habit and structure of the stroma. Unfortunately no ascospores could be found, but he is convinced that the two fungi are identical. The type of *Gibbera tinctoria* Mass. was collected on leaves of *Monotes glaber* at Hunyani, S. Rhodesia by Allen. (Rhod. Agric. Dept. Herb. 737).

173. *Venturia Cephalariae* Kalch. et Cke.

South African Fungi in Grevillea IX (1880) p. 31, tab. 137, fig. 36; Sacc. Syll. Fung. I (1882) p. 593.

Leaf spots scattered, round or somewhat irregular in outline, light brown with a purple margin, up to 4 mm. diam. Perithecia epiphyllous, in groups; at first veiled by the cuticle

in which is developed a thin plate of fungous tissue, composed of pale fuscous to dark brown, tortuous, branching and anastomosing hyphae ca.  $5\ \mu$  thick, and extending towards the edge of the leaf spot. Perithecia in small or larger groups, globose,  $100\text{--}125\ \mu$  diam., or if crowded, ovate to ellipsoid through mutual pressure and sometimes  $60\text{--}75\ \mu$  diam., but uniformly ca.  $125\ \mu$  high; ostiole erumpent, flat or broadly conical, traversed by a pore  $15\text{--}20\ \mu$  broad, crowned with 6 to 12 or more numerous setae; setae erect, rigid, straight or slightly and irregularly curved, not septate,  $25\text{--}42\cdot5\ \mu$  long, blackish-brown, sub-opaque,  $5\text{--}7\ \mu$  thick at the base and tapering upwards to the paler, pellucid, rounded or sub-acute apex. Perithecial wall membranous, below composed of yellow brown, thin-walled, round to oval, somewhat angular cells  $5\text{--}7\ \mu$  diam.; cells smaller,  $5\text{--}7\ \mu$  diam. and darker brown above, where the wall is continuous with the hyphal plate in the cuticle. Asci numerous, 8-spored, clavate or clavate-ellipsoid, straight or slightly curved, often narrowing slightly towards the rounded apex, tapering gradually downwards, sessile or sub-sessile,  $55\text{--}60 \times 11\text{--}12\cdot5\ \mu$ ; with a firm wall, ca.  $1\cdot5\ \mu$  thick, not thickened at the apex when mature. Spores distichous, clavate, very unequally 1-septate, pale fuscous, broadly rounded above, tapering to the base, not constricted at the septum,  $20\text{--}23 \times 9\text{--}10\ \mu$ ; lower cell only  $6\text{--}6\cdot5\ \mu$  long, conical.

on leaves of *Cephalaria attenuata* (L.f.) R. et Sch., Somerset East, MacOwan 1338, 20813.

**174. *Phaeosphaerella congregata* (Syd.) Doidge n. comb.**

Syn. *Parodiella congregata* Syd., Ann. Myc. 10 (1912) p. 37.

Perithecia epiphyllous, minute, black shining, developing in close, round to irregular groups  $1\text{--}5\ \text{mm.}$  diam.; leaf tissues not discoloured; immersed, sub-cuticular, more or less closely crowded, globose,  $60\text{--}100\ \mu$  diam. Perithecial wall membranous, at first olivaceous tinged with dull bluish-green at the apex, then becoming yellowish-brown at the base, darker brown and sub-opaque at the apex; at the base formed of several layers of more or less angular, thin-walled cells,  $7\text{--}8\ \mu$  diam.; more closely parenchymatous at the apex, composed of cells  $3\text{--}6\ \mu$  diam.; traversed by a round pore  $15\text{--}20\ \mu$  diam. Asci few, (2-7) in each perithecium, 8-spored, apophysate, sessile or sub-sessile, very variable in form and size; sometimes ovate or sub-globose,  $30\text{--}40 \times 20\text{--}30\ \mu$ , sometimes elongated, saccate,  $50\text{--}65 \times 15\text{--}20\ \mu$ ; with a firm wall ca.  $1\ \mu$  thick, more or less thickened at the apex. Spores distichous to tristichous, ellipsoid-oblong to sub-clavate,  $26\text{--}30 \times 6\text{--}7\cdot5\ \mu$ , rounded at both ends or occasionally sub-truncate below, constricted at the septum; at first sub-hyaline, then dark (olive-grey to iron grey, Ridgway); cells sub-equal or the upper slightly shorter and broader.

on leaves of *Limnanthemum thunbergianum* Griseb., Belfast, Doidge, 765.

In the revision of the genus *Parodiella* by Theissen and Sydow (Ann. Myc. 15, 1917, p. 112) this species is excluded, and it is suggested that it probably belongs to the genus *Phaeosphaerella*.

**175. *Cryptodidymosphaeria clandestina* Syd.**

in Ann. Myc. 37 (1939) 192-196.

Syn. *Phaeodothis Tristachyae* Syd. in Ann. Myc. 10 (1912) 4; Doidge in Bothalia 1 (1922) 67.

Perithecia parasitic in the stomata of Phyllachoraceae, entirely filling the cavities of the perithecia of the host, and conforming with them in shape and size, flattened-globose or somewhat irregular,  $150\text{--}250\ \mu$  diam.; ostiole papilliform, usually fused with the ostiole of the host fungus, rarely erumpent through a small longitudinal crack, traversed by a round, poorly defined pore about  $15\ \mu$  diam. Wall membranous, almost fleshy,  $6\text{--}10\ \mu$  thick, composed of 2-3 layers of round or irregularly angular cells; at the sides these are somewhat elongated and arranged in more or less vertical, ascending rows; cells rather thick-walled, light yellow brown or honey yellow, often somewhat darker near the apex of the perithecium,  $3\text{--}5\ \mu$  diam.; the outer surface of the perithecial wall is fused and merged with that of the

host and is thus not sharply defined. When the *Phyllachora* is attacked at an early stage of its development, its perithecia are not formed and then the perithecia of the parasite develop in the mesophyll of the leaves, under the phyllachoroid clypeus. Asci rather numerous, 8-spored, clavate, broadly rounded above, tapering gradually downwards, subsessile or with a rather thick, knob-like foot, wall rather thick, slightly but definitely thickened round the apex, p. sp.  $60-70 \times 8-10 \mu$ . Spores more or less distichous, fusiform or biconical, tapering slightly to both obtusely rounded ends, but often somewhat more definitely towards the lower end, straight or somewhat asymmetrical, seldom slightly curved, 1-septate at or near the middle, not constricted or slightly so, rather dark grey-brown or olive brown,  $11-17 + 4-5 \mu$ . Paraphyses typical, filiform, simple or somewhat branched, about  $1-1.5 \mu$  thick, only tardily becoming mucilaginous.

Pycnidia similar to the perithecia in growth and development, but often somewhat smaller and not completely filling the cavity of the host perithecium, fusing above with the inner wall of the latter, but not always reaching to the base, so that a small, irregularly crescent-shaped space is left between the pycnidial wall and the wall of the host perithecium; this space is filled with yellow brown vestiges of the fruiting layer of the host, permeated by the subhyaline, indistinctly septate, loosely branched hyphae of the parasite. Pycnidial wall finely and often very delicately membranous,  $6-8 \mu$  thick, consisting of 2-3 layers of cells; cells very pale yellow or yellow brown,  $3-5 \mu$  diam., round or somewhat elongated. Conidia massive, ellipsoid or ovate, broadly rounded at both ends, straight, rarely somewhat asymmetrical or very slightly curved, 1-celled, very pale greyish brown,  $6.5-9.5 \times 3-4.5 \mu$ , borne on somewhat conical or papilla-like conidiophores over the whole inner surface of the pycnidial cavity.

on *Phyllachora Tricholaenae* P. Henn., on *Rhynchelytrum repens* (Willd.) Hubb., Donkerpoort, Pretoria distr., *Doidge and Bottomley*, 29738.

on *Phyllachora Doidgeae* Syd., on *Cymbopogon marginatus* (Steud.) Stapf, Donkerpoort, *Doidge and Bottomley*, 29744, 29800.

on *Phyllachora Cynodontis* (Sacc.) Niessl., on *Cynodon Dactylon* L., Donkerpoort, *Doidge and Bottomley*, 29749.

on *Phyllachora* spp. on *Tristachya leucothrix*, Trin., (Type of *Phaeodothis Tristachyae* Syd.) Mooi River, Natal, *Burt Davy*, 1470; and on *Eragrostis* sp., Donkerpoort, *Doidge and Bottomley*, 29746.

Sydow took as his type a collection on *Phyllachora afra* Syd. on the leaves of *Sporobolus pyramidalis*, made by Deighton in Sierra Leone. He states that probably other *Phaeodothis* spp. on grasses, particularly the South African species *Ph. Tristachyae* Syd. will prove to be only *Phyllachora* plus *Cryptodidymosphaeria*, and that this must be decided by an examination of good material. The size of the spores of *Ph. Tristachyae* in the original description is given as  $12-13.5 \times 3-4 \mu$ ; a careful examination of the type collection indicates that spores up to  $15 \times 5 \mu$  are not infrequent, and I can find nothing to differentiate this species from *Cryptodidymosphaeria clandestina*.

The conidial stage appears to be identical with *Coniothyrium occultum* Syd. (Ann. Myc. 35 (1937), 281, and loc. cit.).

#### 176. *Dimerosporiopsis Engleriana* P. Henn.

in Hedwigia XL (1901) p. (173); Syll. Fung. XVII (1905) 681; Sydow in Ann. Myc. XVIII (1920) pp. 181-182.

Syn. *Dimerosporium Englerianum* P. Henn. in Pilz. Ostaf. (1931) p. 31.

*Dimerium Englerianum* Sacc. et D. Sacc. in Syll. Fung. XVII p. 537.

*Aloysiella ruwenzorensis* Mattir. et Sacc. in Annali di Botanici VII (1908) p. 143.

*Oothia deformans* Pat. in Bull. Soc. Myc. France XXXIV (1918) p. 19.

*Gibbera Engleriana* (P. Henn.) van der Byl in South Afr. Journ. Sci. 25 (1928) p. 182.

?*Antennularia* (Coleroa) *Engleriana* (P. Henn.) v. Hohn., Fragm. Myk. XI (1909) 5.



Fungus cauliculous, causing some thickening and distortion of the affected parts, and covering them with a dark brown to black mycelial growth, which is often continuous for several centimetres. Mycelium extending through the cortex, and producing in the tissues of the host numerous small cushions, cellular in structure and irregular in form and size; these are brown, and formed of cells which may be irregularly polygonal and  $5-10\ \mu$  diam., or, especially towards the periphery, with a tendency to become cubical and to develop in rows at right angles to the surface of the stem. At the surface, these cushions give rise to tufts of erect hyphae, which become so numerous as to completely clothe the stem with a turf-like growth. Erect hyphae brown, thick-walled,  $5-6\ \mu$  thick, up to  $400\ \mu$  high, septate; cells  $20-25\ \mu$  long; sparingly branched and often tortuous and tangled. Perithecia numerous, nestling amongst the erect hyphae and attached to them at the base, globose or somewhat flattened, not setose,  $220-350\ \mu$  diam.,  $250-300\ \mu$  high, collapsing and becoming cupulate when dry. Perithecial wall rough externally, grossly verrucose, olivaceous, composed of several layers of irregularly polygonal cells  $10-15\ \mu$  diam.; without true ostiole, but with a thin place at the apex which breaks down and forms an irregular pore. Asci 8-spored, paraphysate, cylindrical, rounded above, up to  $100\ \mu$  long; sporiferous part  $75-80 \times 10-12.5\ \mu$ ; sterile portion below tapering to a well-defined foot. Paraphyses not numerous, hyaline, filiform. Spores distichous, 1-septate, pale olivaceous, clavate-ellipsoid rounded at ends, very slightly constricted at the septum, pluriguttulate,  $16-19 \times 6-7\ \mu$ . The spores examined from these South African collections were barely mature; the dimensions of the spores are given elsewhere as  $18-25 \times 7-10\ \mu$ .

on *Erica cristaeiflora* Salisb., on stems Tulbagh, *Dippenaar* (van der Byl, loc. cit.).

*Erica imbricata* L., Klapmuts, *Acock*, 27668.

*Erica leucopelta* Tausch., bush behind village, Knysna, *Bottomley*, 30729.

*Erica peltata* Andr., Knysna, *Bottomley*, 30730.

*Erica* spp., Cape, MacOwan; Hermanus, *Pole Evans*, 27697, 27704; Tulbagh, *Dippenaar* (v. d. Byl).

*Scyphogene inconspicua* Brogn., Hermanus, *Pole Evans*, 27703, *Louwrens*, 30731.

This fungus was first described by Hennings on *Ericinella Manii* collected by Volken in tropical Africa, and it appears to be a very common parasite on various genera of the Ericaceae in tropical Africa. Its nomenclature has been discussed by Sydow (loc. cit.) and der Byl (l.c.); the latter author puts it into the genus *Gibbera*. Dr. Sydow states (in litt.) that "It is difficult at present to say to what genus it should be assigned, as the genera *Coleroa*, *Antennularia*, *Gibbera*, *Othia* and similar ones need revision. I think, however, that the fungus can hardly be called a *Coleroa* or *Antennularia*. Its relationship is rather with *Gibbera* and *Othia*. The fungus has twice been put into a separate genus, namely *Dimerosporiopsis* (1901) and *Aloysiella* (1908). It might well prove that the fungus really represents a distinct genus. Therefore I would propose to name it for the present *Dimerosporiopsis Engleriana* Henn."

# 177. *Pseudothyridaria moroides* Syd.

in Ann. Myc. 37 (1939) 182-184.

Stromata solitary, distant, gall-like, carinate, parallel with the axis of the stem, from which they become erumpent through longitudinal cracks; on the smaller twigs these are up to 13 mm. long, about 4 mm. broad and up to 2 mm. high; on larger stems they may be up to 3.5 cm. long, 7.5 mm. broad and 4 mm. high; on old branches lesions have been seen up to 7 cm. long and 5 mm. broad, but in these the stromata are old and brittle or broken down. The hypostroma which seems to originate between the wood and the cortex, either consists of a parenchymatous tissue of very thin-walled, hyaline or sub-hyaline, rounded-angular cells,  $4-10\ \mu$  diam., which includes discoloured and collapsed remnants of the substratum, or takes the form of erect plates,  $150-200\ \mu$  thick, orientated in the direction of the longitudinal axis of the host, tapering inwards and pressing like wedges between the

cells of the host. After breaking out from the host tissues, the stroma spreads on both sides of its longitudinal axis, forming irregular stromatal cushions, with a definite fissure or fold in the centre which remains sterile; the folded and wrinkled stromatic surface is dull grey or brownish black, in the fertile parts closely verrucose throughout the formation of convex processes over the ostioles of the perithecia. Ground tissue of the stroma parenchymatous, pale grey or greyish brown within, and composed of round or irregularly angular, or elongated cells  $5-12\ \mu$  diam.; at the surface there is an apical crust,  $90-140\ \mu$  thick, composed of greyish-black, thick-walled opaque cells arranged in more or less definite vertical rows.

Perithecia monostichous, completely and often deeply immersed, in the stroma, globose or globose-ovate, often somewhat flattened and irregular through mutual pressure,  $200-400\ \mu$  diam., rarely larger. Ostioles cylindrical, completely innate in the stroma, punctiform-erumpent, not emerging or barely so, truncate, not grooved, traversed by a pore  $30-40\ \mu$  broad. Perithecial wall membranous, often definitely recognisable only at the base and the sides,  $15-20\ \mu$  thick, consisting of several layers of much-compressed subhyaline cells. Asci numerous, 8-spored, cylindrical-clavate, broadly rounded above, tapering slightly but decidedly downwards into a short stalk, thin-walled, p. sp.  $100-130 \times 6-8\ \mu$ . Spores obliquely monostichous or incompletely distichous, fusiform, tapering more or less to the obtusely rounded ends, straight or slightly bent, 3-septate, less frequently 1-2-septate, not constricted, or very slightly constricted in the middle, light yellow brown or honey yellow,  $16-30 \times 4-6\ \mu$ . Paraphyses very numerous, rather coarsely filamentous, usually simple  $1.5-2.5\ \mu$  thick, exceeding the asci.

on stems of *Rubus pinnatus* Willd., Xumeni Forest, near Donnybrook, Natal, *Morgan* and *Doidge*, 30374.

#### 178. *Ceratosphaeria crinigera* (Cke.) Sacc.

Syll. Fung. II (1883) p. 227.

Syn. *Sphaeria* (*Ceratostoma*) *crinigera* Cke. in *Grevillea* I (1873) p. 156.

Perithecia innate, becoming erumpent and finally superficial, scattered or in small groups, surrounded at the base by brown hyphae, which are long, flexuous, septate,  $2-3\ \mu$  thick; perithecia flask-shaped, rugulose, densely clothed—except in the upper part of the neck—with dark brown, simple, flexuous, septate setae, which are of varying length and obtuse at the apex; basal part of perithecia sub-globose to ovate,  $300-450\ \mu$  diam.; neck  $250-400\ \mu$  long,  $150-180\ \mu$  thick, traversed by a pore which is up to  $90\ \mu$  broad and closely lined with fine, hyaline periphyses. Wall of perithecium dark brown to black,  $60-75\ \mu$  thick, composed of numerous layers of flattened cells; inner layers brown, thin-walled and up to  $12.5\ \mu$  diam., outer layers black, opaque, and structure not easily seen. Asci very numerous, 8-spored, cylindrical-clavate, rounded above, tapering towards the base, sessile,  $70-75 \times 7.5-9\ \mu$ . Paraphyses hyaline, filiform, disappearing early. Spores obliquely monostichous, hyaline, cylindrical to ellipsoid, broadly rounded at the ends, 3-septate, not constricted at the septa,  $9-11.5 \times 3.75-4\ \mu$ .

on rotting wood, Xumeni Forest, near Donnybrook, Natal, *Morgan* and *Doidge*, 30368.

On comparison the South African fungus is not found to differ from European specimens of this species. It was first described on pine wood in Great Britain, and its occurrence in South Africa is of interest.

#### 179. *Eudarlucella australis* Speg.

in *Revista del Museo de la Plata* XV (1908) 22; Syd. in *Ann. Myc.* 24 (1926) 360-362.

Syn. *Myrmaecium cannae* Dearn. et Barth. in *Mycologia* 9 (1917) 347; Syll. Fung. 24, p. 759; Petrak in *Ann. Myc.* 25 (1927) 301.

Stromata developing in the uredo-sori of rust fungi; basal stroma growing into the mesophyll of the leaf, erumpent, more or less parenchymatous, consisting of light-coloured,

thin-walled cells, which, immediately under the loculi, are often in vertical rows. Loculi single more or less central, often completely immersed; or 2-3, of which 1 or 2 are lateral and project from the stromata; stroma often numerous and crowded, so that a large number of loculi are observed in close proximity. Loculi broadly ovate or ellipsoid, about  $100-160\mu$  diam., quite closed without a trace of an ostiole, or, less frequently, very obtusely and broadly conical at the apex, which is traversed by a pore; the pore is irregularly round to angular. Walls of the loculi  $15-25\mu$  thick, formed of several layers of round to angular, rather thin-walled cells; outer layers translucent, dark brown,  $7-12\mu$ , or rarely up to  $15\mu$  diam. not compressed or only slightly so; inner layers much compressed and usually hyaline. Asci rather numerous, 8-spored, cylindrical-clavate or cylindrical, broadly rounded above, tapering somewhat towards the base, quite sessile or with a short thick foot, thick-walled, not thickened at the apex or very slightly so, sporiferous part  $65-80 \times 7.5-10\mu$ . Spores obliquely monostichous or incompletely distichous, fusiform, tapering to both bluntly rounded ends, straight, rarely slightly bent, usually with three cross walls of which only the central one is readily distinguishable, not constricted, or slightly constricted at the central septum, hyaline,  $14-21\mu$  (mostly about  $17\mu$ ) long and  $3.5-5\mu$  (usually  $4\mu$ ) broad. Paraphysoids very sparse. Conidial loculi (*Darluca*) smaller than the ascigerous loculi, are usually to be found in an empty or over-ripe condition on the edges of the stroma.

in uredo-sori of *Puccinia Eragrostidis-superbae* on leaves of *Eragrostis happula* Nees var. *divaricata*, Derdepoort, Pretoria Distr., Doidge and Bottomley, 29813, and on *Eragrostis superba*, without locality, 14124.

on *Uredo* undet. on leaves of *Eragrostis* sp., Irene, Pretoria Distr., S. Smuts, 17014.

In the first two numbers quoted, the uredo-spores and paraphyses of the *Puccinia* can be found beyond the edges of the stroma; traces of a rust have also been found in 17014.

It was suggested by Spegazzini (loc. cit.) that this is the ascus stage of *Darluca filum*, and in specimens collected at Costa Rica, Sydow actually found the conidial form in the same uredo-sori as the ascus stage. Petrak (l.c.) also found the conidia associated with the ascus stage of *Myrmecium Cannae* Dearn. et Barth. in the uredo-sori of *Puccinia Cannae*, and states that the latter fungus is identical with *Eudarluca*. The South African fungus is not very well developed, but is definitely identical with the fungus described from the American collections; the *Darluca* stage has been detected associated with the *Eudarluca* in these collections also.

#### 180. *Lasiosphaeria hispida* (Tode) Fuck.

Symb. myc. (1869) p. 147; Syll. Fung. II, p. 194; Seaver in Mycologia IV (1912) p. 119. Syn. *Lasiosphaeria capensis* Kalch et Cke. in Grevillea 9 (1880) p. 28, Syll. Fung. II, p. 195.

Perithecia more or less closely gregarious, surrounded by a web of black mycelium; the mycelium consists of dark brown to blackish brown hyphae, rather remotely septate, sparsely branched,  $5-6\mu$  thick. Perithecia ovoid to pyriform,  $300-500\mu$  diam.,  $450-600\mu$  high; outer wall rough and clothed with numerous, dark brown, remotely septate hairs, which are very long and flexuous near the base, shorter, straighter and more rigid towards the apex; the latter are  $50-100\mu$  long,  $6-7.5\mu$  thick at the base, and tapering somewhat to a blunt apex. Perithecial wall irregular in thickness; inner part dark brown, consisting of several layers of very much flattened cells; outside this is an irregular layer of rather loosely compacted pseudoparenchyma. Asci cylindrical-clavate, 8-spored, rounded above, tapering somewhat to the base and briefly pedicellate,  $160-180 \times 12-18\mu$ . Spores distichous, twisted, subclavate or cylindrical, rounded at both ends, often bent near one end, 7-septate, at first hyaline, then pale fuscous,  $50-80 \times 6-8\mu$ .

on bark, Somerset East, Cape. MacOwan 1397, 20817.

There is only a small part of the original collection in the Cryptogrammic Herbarium; no further collections have been made. There appears to be no difference between this fungus and *Lasiosphaeria hispida* as defined by Seaver; for Seaver's list of synonyms see Mycologia (loc. cit.)



181. *Leptosphaeria Sacchari* van Breda.

Meded. v. Proefstat. v. Suikerr. in West Java (1892) p. 25; Butler, Fungi and Disease in Plants (1918), p. 381; van der Byl, Union Dept. Agric. Sc. Bull. 10 (1918) p. 15.

Perithecia developing in leaf spots, which are often numerous on a single leaf, scattered, more or less elliptic in outline, visible on both surfaces of the leaf, up to 15 mm. long and 5 mm. broad, dry, straw-coloured in the centre and sharply defined by a narrow, reddish purple or brownish margin; this ring is not usually regular, but lobed, or broken by angular projections; neighbouring leaf spots often become confluent, and form larger irregular blotches. The discoloured leaf tissues are permeated by fine, hyaline hyphae about  $1\ \mu$  thick. Perithecia numerous, epiphyllous, rarely hypophyllous, arranged in rows between the finer veins of the leaf, remote from one another or more closely placed, but not crowded, immersed in the mesophyll, globose or sub-globose,  $100\text{--}155\ \mu$  diam., narrowed above into an apical papilla; papilla up to  $75\ \mu$  long, erumpent, protruding slightly from the epidermis, traversed by a rather indefinite pore. Perithecial wall pale to darker yellowish brown, translucent, composed of rather thin-walled, angular, slightly compressed cells  $5\text{--}10\ \mu$  diam. Asci fairly numerous, 8-spored, cylindrical to clavate, straight or curved, rounded above, briefly pedicellate with a short, knob-like foot,  $70\text{--}80 \times 12\text{--}12.5\ \mu$ ; wall firm, slightly thickened at the apex. Spores distichous, 3-septate, fusoid to sub-clavate, tapering to rounded ends, constricted at the septa, at first hyaline, then fuscous,  $20\text{--}25 \times 5\ \mu$ . Paraphyses fairly numerous, hyaline, filamentous, ca.  $1\ \mu$  thick, exceeding the asci.

on leaves of *Saccharum officinarum* L., Natal Sugar Estates, *McMartin*, 31040, 31041.

The so-called "ring spot" of sugar cane, caused by *Leptosphaeria Sacchari*, was first described in Java, and occurs in many countries where sugar cane is cultivated. It was recorded by van der Byl (loc. cit.) from Natal and Zululand in 1918.

182. *Sporormia transvaalensis* Doidge nov. sp.

Perithecia sparsa v. gregaria, immersa, deinde erumpentia et in maturitate partim denudata, globosa v. ovoidea,  $450\text{--}500\ \mu$  diam.,  $500\text{--}700\ \mu$  alta, rugulosa, coriacea, opace nigra, pariete ca.  $60\ \mu$  crasso, ostiolo conico-truncato v. sub-cylindraceo, usque  $200\ \mu$  longa; asci cylindraceo-ellipsoidei, 8-sporei, apice rotundati, breve stipitati,  $95\text{--}110 \times 17.5\text{--}20\ \mu$ , crasse tunicati; sporae distichae, cylindraceae, 3-septatae, opace brunneae, profunde constrictae, facile secedentes,  $40\text{--}45 \times 6\text{--}7\ \mu$ , articulis subaequalibus, strato gelatinoso angusto obvolutae.

Hab. in fimo bovino, Kromrivier, leg. *Doidge*, 30235.

Perithecia scattered or in groups, immersed, later becoming more or less erumpent and often partly exposed at maturity, globose-ovoid,  $450\text{--}500\ \mu$  diam.,  $500\text{--}700\ \mu$  high, opaque black, coriaceous, wall about  $60\ \mu$  thick, outer layers opaque, tuberculate on the surface, inner layers dark brown to fuscous, composed of somewhat flattened, thin-walled cells; ostiole a truncated cone or sub-cylindrical, up to  $200\ \mu$  long. Asci cylindrical to ellipsoid, 8-spored, rounded at the apex, briefly stipitate,  $95\text{--}110 \times 17.5\text{--}20\ \mu$ , thick-walled, wall  $1.5\text{--}2.5\ \mu$  thick. Paraphyses not seen (material rather old). Spores distichous, cylindrical, 3-septate, dark brown, opaque, deeply constricted and readily separating at the septa, surrounded by a thin mucous layer,  $40\text{--}50 \times 6\text{--}7\ \mu$ ; segments sub-equal, medial segments cylindrical, terminal segments subcylindrical, tapering very slightly to broadly rounded ends.

on cow dung, Kromrivier, Rustenburg District, Transvaal, *Doidge*, 30235.

Gibbs, in the Journal of the Linnean Society 38 (1909) p. 416, mentions three species of *Sporormia* collected by Cheesman in the Matoppo Hills. One of these, *Sporormia pascua* Niessl has 7-septate spores, *Sp. Ambigua* Niessl and *Sp. intermedia* Auersw. have 3-septate spores, but differ from the fungus described above in the size of the perithecia, asci and spores. There appear to be no other records of fungi of this genus occurring in South Africa.

183. *Rhynchosphaeria Fagarae* Doidge nov. sp.

*Perithecia* sparsa v. pauca sub-aggregata, immersa, globosa, coriaceo-carbonacea, ostiola cylindracea usque  $200\ \mu$  longa pertusa,  $200\text{--}220\ \mu$  diam. Asci numerosi, clavati, apice rotundati, basim versus attenuati, breviter pedicellati, 8-spори,  $45\text{--}60 \times 6\text{--}7.5\ \mu$ . Sporae distichae, clavatae, plus minus curvatae v. rectae, utrinque obtusae, 3-septatae, ad septa, praecipue medium, constrictae, ex hyalino brunneolae,  $11\text{--}12.5 \times 3.5\text{--}3.75\ \mu$ .

Hab. in cortice *Fagarae capensis* Thunb., Boschfontein, Pretoria distr., leg. Doidge et Bottomley, 31067.

*Perithecia* scattered or in small groups, immersed in the cortex, seated at the base on the wood, sub-carbonaceous, globose, narrowed above into cylindrical ostioles, which protrude somewhat from the periderm,  $200\text{--}220\ \mu$ , diam. Ostioles cylindrical, up to  $200\ \mu$  long straight or curved, ca.  $60\text{--}80\ \mu$  thick, often dilated somewhat near the entire apex; traversed by a pore lined with numerous fine, hyaline periphyses. Perithecial wall firm,  $15\text{--}25\ \mu$  thick, blackish brown, outer layers opaque, inner more or less translucent, mostly  $5\text{--}10\ \mu$  diam.; giving place within to a hyaline, filamentous layer. Outwardly the wall is connected with a tangle of loosely interwoven, fuscous hyphae,  $2\text{--}2.5\ \mu$  thick, permeating the cortical tissues which are more or less broken down. Asci very numerous, lining about seven-eighths of the perithecial cavity, 8-spored, clavate, straight or slightly curved, rounded above, tapering at the base to a short stalk,  $45\text{--}60 \times 6\text{--}7.5\ \mu$ ; wall very firm, not staining blue with iodine. Paraphyses very numerous, hyaline, slender, filiform, barely  $1\ \mu$  thick, exceeding the asci. Spores distichous, clavate, 3-septate, hyaline then light brown, tapering to blunt ends, slightly constricted, sometimes more deeply at the central septum,  $11\text{--}12.5 \times 3.5\text{--}3.75\ \mu$ ; the second cell from the upper end is the broadest.

on branches of *Fagara capensis* Thunb., Boschfontein, near Wolhuter's Kop, Pretoria distr., Doidge and Bottomley, 31067.

184. *Pseudovalsa longipes* (Tul.) Sacc.

in Syll. Fung. 2 (1883) p. 136; Winter in Rabh. Kryptog. Flora von Deutschland II, p. 787; Petrak in Ann. Myc. XXI (1923) pp. 323–324.

Syn. *Melanconis longipes* Tul. Carp. II, p. 139.

*Calospora longipes* (Tul.) Berlese in Icones fung. I (1894) p. 117 tab. CXXII fig i.

*Coryneum Kunzei* Corda Ic. Fung. IV, p. 46; Syll. Fung. III, p. 778.

Stromata corticolous, seated on the wood, scattered, discrete, black, irregularly round to elliptic,  $1\text{--}2.5\ \text{mm.}$  diam., rather smooth above, surrounded and partially veiled by the ruptured cortex. *Perithecia* 4–12 in each stroma, globose or flattened by mutual pressure,  $270\text{--}400\ \mu$  diam.,  $300\text{--}350\ \mu$  high; ostioles convergent, oblique and curved on marginal *perithecia*,  $250\text{--}450\ \mu$  long, not prominent. Asci paraphysate, 8-spored, cylindrical-clavate, rounded at the apex, briefly pedicellate,  $110\text{--}155 \times 20\text{--}22.5\ \mu$ ; wall about  $1.5\ \mu$  thick thickened at the apex to  $5\text{--}6\ \mu$ . Spores distichous or irregular, fusiform-clavate, hyaline, mostly 3-septate, less frequently 2- or 4–5-septate, tapering at both ends, terminal cells conical, not constricted, separating rather readily at the septa,  $50\text{--}70 \times 7.5\text{--}9\ \mu$ . The spores are barely mature in these *perithecia*; according to Winter the mature spores are brown.

Conidial stage is a *Coryneum*; acervulae scattered or more or less crowded, sometimes on the same twigs as the ascigerous stromata, black, disciform, erumpent, surrounded by the ruptured outer bark,  $1\text{--}1.5\ \mu$  diam.,  $350\text{--}450\ \mu$  high; base composed of a loose weft of brown, thin-walled hyphae, which become erect near the surface and give rise to numerous conidiophores. Conidiophores pale olivaceous to almost hyaline, more or less flexuous, up to  $150\ \mu$  long, about  $5\ \mu$  thick at the base and tapering upwards to  $2.5\text{--}4\ \mu$ . Conidia olivaceous brown, 4–7-septate, frequently 5-septate, clavate, more or less curved, rarely straight, curvature usually more acute near the upper end, tapering somewhat to the apex which is paler, often sub-oblique, rounded, tapering gradually downwards into the conidiophore,  $40\text{--}75 \times 12\text{--}14\ \mu$ .

on branches of *Quercus* sp., Wellington, *Doidge*, 2163.

The conidial stage has been collected several times on branches of *Quercus* sp., Wellington, *Doidge*, 987, 2161, 2162.

The ascospores are barely mature; Winter states that the mature spores are brown, in which case the fungus belongs to the genus *Pseudovalsa*, and not to *Calospora* as stated by Berlese who saw only hyaline spores. Petrak is also of the opinion that this species is a genuine *Pseudovalsa*. On comparison with European specimens, it was found that the South African fungus was identical with *Pseudovalsa longipes*. The species is rare in Europe.

According to Saccardo, the conidial stage is *Coryneum Kunzei*, Cda.

#### 185. *Pleospora Doidgeae* Petr.

in Ann. Myc. 25 (1927) 293-295.

Syn. *Dictyochorella andropogonis* Doidge in Bothalia I (1922) p. 66.

Perithecia formed in a phyllachoroid stroma, usually scattered, less frequently close together and then arranged in longitudinal rows, flattened globose or ellipsoid, very variable in size, 150-320  $\mu$  diam. and 100-200  $\mu$  high; ostiole erumpent on the upper or lower leaf surface, conical truncate, opening by a round pore. Perithecial wall membranous, usually about 8-10  $\mu$  thick, composed of a few layers of rather closely compressed cells; the cells are irregular or polygonal, thin-walled, about 5-8  $\mu$ , rarely up to 10  $\mu$  diam., they are pale, translucent, yellow-brown or clove brown, but always darker coloured near the apex. It sometimes happens that single perithecia occur outside the phyllachoroid stroma, but near its edge; such perithecia have usually a stronger wall, up to 25  $\mu$  thick. Asci clavate or clavate-cylindrical, broadly rounded at the apex, more or less tapering below, sessile or with a short, thick foot, becoming greatly distended as they begin to mature, with a firm, thick wall, 8-spored, about 60-80  $\mu$  long, later up to 100  $\mu$  long, 12-15  $\mu$  broad. Spores ellipsoid or ellipsoid-fusiform, tapering considerably to the obtuse ends, straight or slightly curved, with three or very seldom four cross walls, decidedly and often deeply constricted at the centre, elsewhere not constricted at the septa or only very slightly so; the second cell from the apex often projects slightly, and is sometimes traversed by a longitudinal wall, which is often oblique and usually very inconspicuous. Spores comparatively light yellow-brown or olive-brown, 13-18  $\mu$  long, seldom up to 20  $\mu$  long, 6-7.5  $\mu$  broad. Paraphyses very numerous, coarsely filamentous, branched, 1-1.5  $\mu$  thick, coalescing above with the perithecial wall.

In a phyllachoroid stroma on leaves of *Cymbopogon validus* Stapf. (= *Andropogon nardus* L. var. *validus*), Tugela Valley near Mont-aux-Sources, Natal, *Doidge*, 14104.

After making a detailed study of this fungus, Petrak came to the conclusion that it is not a Phyllachoraceae with muriform spores, but a typical *Pleospora* parasitic in the stroma of a *Phyllachora*. He considers it extremely unlikely that there is such a thing as a true phaeo-dictyosporous phyllachoroid fungus.

It seems likely that the stroma in which this fungus is parasitic is that of *Phyllachora Doidgeae* Syd., which it resembles, and which occurs commonly on leaves of Andropogoneae. As indicated in the original description (Bothalia loc. cit.) the fungus has a true *Hendersonia* pycnidial stage.

#### 186. *Ophiobolus Stipae* Doidge nov. sp.

Perithecia sparsa vel laxe gregaria, subglobosa, atra, 250-350  $\mu$  diam., immersa; ostiolo truncato, conoideo, 85-90  $\mu$  alto et 125-135  $\mu$  lato, tandem erumpentia, glabra, pseudoparenchymatice contexta, obscure olivacea, cellulis parietis 12-15  $\mu$  diam.; asci fasciculati cylindraneo-clavati, 8-sporei, 100-150  $\times$  7-8  $\mu$ , breviter stipitati, ad apicem rotundati membrana in ascis junioribus ad apicem incrassata, usque ad 8  $\mu$ ; paraphyses copiosae,



hyalinae, circiter  $1\ \mu$  crassae, filiformes, ascos quoad longitudinem aequantes vel superantes, sporae filiformes, fere ascorum longitudine, pluri-guttulatae, in massa flavo-brunneae; singulae subhyalinae, utrinque attenuatae, rectae vel flexuosae,  $100-125 \times 2-2.5\ \mu$ .

Hab. in vaginis *Stipae dregeanae* Steud., in silvis prope Donnybrook, leg. *Morgan et Doidge*, 29829.

Perithecia scattered or loosely grouped, sub-globose, black,  $250-350\ \mu$  diam., immersed, at length erumpent; ostiole truncate, conoid,  $85-90\ \mu$  high and  $125-235\ \mu$  broad. Perithecia smooth, wall pseudoparenchymatous in structure, dark olivaceous, composed of cells  $12-15\ \mu$  diam. Asci fasciculate, cylindrical-clavate, 8-spored,  $100-150 \times 7-8\ \mu$ , briefly stipitate, rounded at the apex; in the younger asci the wall is thickened at the apex, up to  $8\ \mu$ . Paraphyses copious, hyaline, about  $1\ \mu$  thick, filiform, equalling the asci in length or longer. Spores filiform, almost as long as the asci, pluriguttulate, yellow-brown in mass, singly sub-hyaline, tapering to both ends, straight or flexuous,  $100-120 \times 2-2.5\ \mu$ .

on dying sheaths of *Stipa dregeana* Steud., Xumeni Forest near Donnybrook, Natal, *Morgan and Doidge*, 29829.

187. *Hysterostoma Acocantherae* (P. Henn.) Theiss. et Syd. in Ann. Myc. 13 (1915) pp. 238-239.

Syn. *Dimerosporium Acocantherae* P. Henn. in Engl. bot. Jahrb. XVII (1893) p. 4; Syll. Fung. XI, p. 259, on living leaves of *Acocanthera Schimperi* in Erythraea.

Stromata hypophyllous, circular in outline, dull black, 3-5 mm. diam., carbonaceous, rough in the centre and surrounded by a radiating fringe of hyphae. The hyphae are brown, irregular, septate, undulating and anastomosing,  $4-5\ \mu$  thick. The central part of the stroma consists of numerous, closely crowded loculi, which are round to elliptic, irregular,  $150-250\ \mu$  diam., or, if elliptic, up to  $350\ \mu$  long,  $100-150\ \mu$  high; outer covering rather thick, carbonaceous, breaking down irregularly at maturity. The hypostroma is epidermal, colourless, but produces in the air spaces under the stomata an opaque mass of dark brown plectenchyma, which grows through the stomata and produces the fruiting bodies, the hypothecium being thus in direct connection with the hypostroma at several points under each loculus. Hypothecium olive brown, cellular, irregular in thickness. Asci broadly ellipsoid or ovate, paraphysate, 8-spored,  $75-90 \times 35-40\ \mu$ , wall  $2.5-3.5\ \mu$  thick, thickened round the apex, up to  $10\ \mu$ . Paraphyses numerous, hyaline, filiform,  $2-2.5\ \mu$  thick, exceeding the asci. Spores usually distichous, brown, 2-celled, oblong or sub-clavate, rounded at both ends, more or less constricted at the septum,  $30-33 \times 12.5-14\ \mu$ ; upper cell slightly larger and more broadly rounded,  $15-17.5 \times 12.5-14\ \mu$ , lower  $12.5-16 \times 10-11.25\ \mu$ .

on leaves of *Acocanthera* sp., Schagen, Nelspruit distr., Transvaal, *Liebenberg* 29906.

This fungus agrees with the description of *Hysterostoma Acocantherae*, but it is stated (Ann. Myc. loc. cit.) that the type specimen is poorly developed. The South African material shows an older stage, and is better developed. The *Acocanthera* sp. on which it is found differs from the common South African species, and may be a variety of *A. Schimperi*.

188. *Aphysa senniana* (Sacc.) Doidge n. comb.

Syn. *Phaeosphaerella senniana* Sacc. in Ann. Myc. 8 (1910) 337; Doidge in Trans. Roy. Soc. S. Afr. 8 (1920) 118; Sydow in Ann. Myc. 24 (1926) 270-271.

Amphigenous, not producing true leaf spots but often causing an indefinite light brown discolouration. Fruiting bodies in groups, which are more or less sharply defined, irregular or angular, seldom more or less circular, about 1-3 mm. diam., often coalescent and thus producing larger, irregular aggregates; individual fruiting bodies in these groups remote from each other or fairly close together, subcuticular, circular, more or less angular or irregular in outline,  $100-170\ \mu$  in diam., and up to  $50\ \mu$  high. In the crowded groups, two or more individuals may be in close proximity to one another and the edges of the covering membranes fuse. Basal layer perfectly flat, growing out of the epidermis, about  $5-7\ \mu$  thick,

filamentous, composed of small cells, sub-hyaline or pale yellow brown. Covering membrane flattened-conical, opening in the centre, or often more or less excentrically, by a round or irregular pore about  $25\ \mu$  diam. Covering membrane about  $5\ \mu$  thick, composed of 1-2 layers of rounded polyhedral cells; at the margin these are thin-walled, pellucid olive brown and about  $5-7.5\ \mu$  diam.; in the centre near the pore, they are smaller, rather thick-walled, about  $3-5\ \mu$  diam., blackish-brown and almost completely opaque. The covering membrane is not sharply defined at the margin, where it unites at an acute angle with the basal layer, often extending somewhat beyond the edges of the latter. Asci clavate, occasionally slightly distended at the base, tapering slightly to the broadly rounded apex, sessile or with a short, thick, knob-like foot, 8-spored, thick-walled,  $35-45 \times 10-12.5\ \mu$ . Spores more or less distichous, oblong to sub-clavate, obtusely rounded at both ends, tapering somewhat to the lower end, straight or somewhat asymmetrical, rarely slightly bent, 1-septate, cells equal in length or upper slightly shorter, more or less constricted, pellucid, comparatively light olive brown,  $10-13 \times 5-6\ \mu$ . Paraphyses numerous, hyaline or subhyaline, forming indefinite erect masses between the asci, which converge towards the centre of the covering membrane.

on leaves of *Protea caffra* Meisn., Fairy Glen, Pretoria, *Doidge*, 23421; The Willows, Pretoria distr., *van der Byl*, 5590.

on *Protea lepidocarpodendron* Linn., Wellington, Cape, *Doidge*, 1034, 2062.

on *Protea acaulis* Thunb., Wellington, *Doidge*, 1022; Klapmuts, *van der Byl*, 6845.

on *Protea* sp., Mont-aux-Sources, Natal, *Doidge*, 23420.

Originally described by Saccardo (loc. cit.) on dying leaves of *Protea abyssinica* from Erythraea, this fungus occurs commonly on leaves of *Protea* spp. in South Africa.

The South African fungus was studied by Sydow (loc. cit.) who expressed the opinion that it was a *Stigmatea* sp., but reserved his final opinion until more mature specimens had been examined. Further material studied was in better condition, but after an examination of this no amendment seems necessary to the description given by Sydow, from which the above is adapted.

In a previous publication, one of the hosts mentioned for this fungus was *Protea melaleuca*; this plant is now regarded as a form of *Protea lepidocarpodendron*.

#### 189. *Glioniella natalensis* Doidge n. nom.

Syn. *Glioniella multiseptata* Doidge (not Spegazzini) in Trans. Roy. Soc. S. Africa 8 (1920) p. 119.

on stems of *Euphorbia triangularis* Desf., Amanzimtoti, *Doidge*, 5624.

The name *Glioniella multiseptata* has been used by Spegazzini (*Fungi nonnulli Paraguariae et Fugiae* in Rev. mycol. XI 1889, p. 93; Sacc. Syll. Fung. IX, 1891, p. 1113) for a fungus on *Pernetia mucronata* "in Burnt Island, Fugia". A change of name is therefore necessary for the South African fungus.

#### 190. *Pseudographis Chrysophylli* Doidge nov. sp.

*Perithecia dispersa* v. *laxe aggregata*, *innato-erumpentia*, *denum sub-libera*, *primitus globosa* v. *ellipsoidea clausa*, *dein urceolata crasse marginata* et *discum labiis medio distantibus denudantia*, *disco pallido plerumque oblongo rarius orbiculare plano*, *marginem irregulariter sub-crenulato, ruguloso cincta*; *postremo fere sessilia, atra, rugulosa, sub-nitida*, usque  $1.5\ \text{mm.}$  longa et  $1\ \text{mm.}$  lata. Asci numerosi, plerumque 4-sporei, clavati, apice rotundati, basi, sensim attenuati, pedicellati,  $175-200 \times 17.5-25\ \mu$ , densissime paraphysati. Paraphyses filiformes, septatae, ca.  $1.5\ \mu$  crassae, apice clavulatae, incrassatae usque  $3-4\ \mu$ . Sporae monostichae v. sub-distichae, transverse 7-septatae, rarissime 5-septatae, oblongae v. ellipsoideae, rectae v. curvatae, hyalinae, haud constrictae, crasse tunicatae,  $35-50 \times 12-15\ \mu$ .

Hab. in cortice *Chrysophylli magalismontanae* Sond., Boschfontein, Pretoria distr., leg Doidge et Bottomley, 31066.

Perithecia scattered or loosely grouped, developing under the periderm which soon becomes ruptured, becoming erumpent; at first flattened globose, closed, then urceolate with a thick margin, up to 1.5 mm. long and 1 mm. broad; the surface fissures longitudinally or more or less irregularly, exposing the disc which is oblong or irregularly circular, flat, pale yellowish to flesh colour; lips fairly distant, irregular, black, carbonaceous, rugulose, with numerous irregular cracks. The perithecium is attached by a broad foot, which penetrates the tissues of the host; the torn periderm is closely adherent to the sides of this basal portion. Inner part of perithecium sub-hyaline to pale yellowish brown, formed of closely interwoven hyphae; the ascus-bearing disc forms in this tissue, about half way between the foot and the outer crust, at first bowl-shaped, then more or less flat. Outer crust blackish brown, opaque, carbonaceous, irregular in thickness, 10–20  $\mu$  thick at the upper surface, where it fissures and falls away at maturity exposing the disc, 25–50  $\mu$  thick at the sides where the lips finally develop. Asci numerous, usually 4-spored, occasionally 2-spored, clavate, rounded at the apex, tapering gradually downwards to an irregular foot, 175–200  $\times$  17.5–25  $\mu$ ; wall ca. 1  $\mu$  thick, not thickened at the apex. Paraphyses very numerous, hyaline, simple, septate, flexuous, filamentous, ca. 1.5  $\mu$  thick; clavulate at the tip and thickened to 3.4  $\mu$ , exceeding the asci. Spores monostichous, the two upper spores oblique the two lower straight, or sub-distichous with the two upper spores parallel to one another; at first 1-septate, then 3-septate and finally 7-septate, rarely 5-septate, cylindrical, not tapering to the rounded ends or only slightly so, straight or curved, not constricted, very thick walled, 35–50  $\times$  12.5–15  $\mu$ ; wall 3.5–4.5  $\mu$  thick, cross walls 1.5–2  $\mu$  thick, lumen of cells ellipsoid to conical. The terminal cells occasionally develop germ tubes while still in the perithecium.

on bark of *Chrysophyllum magalismontanum* Sond., Boschfontein, near Wolluter's Kop, Pretoria distr., Doidge and Bottomley, 31066.

191. *Triblidiella rufula* (Sprengl.) Sacc.

Syll. Fung. II (1883) p. 757; Kalch. and Cke., Grevillea IX (1880) p. 26; Kalch., Grevillea X (1882) p. 145; Wakefield, Kong. Norske Vidensk. Selsk. Forhandl. 9, (1936) p. 53.

Perithecia scattered or in groups, erumpent, ellipsoid or oblong, or becoming confluent and irregular, up to 3 mm. long and 1 mm. broad, smooth, brownish black, corneo-coriaceous; disc brick red to reddish brown; lips swollen, transversely striate, curling inwards. Asci 8-spored, narrow cylindrical-clavate, rounded above, tapering below to a short foot, 200–240  $\times$  12.5–15  $\mu$ ; wall firm, ca. 1–1.5  $\mu$  thick, slightly thickened above (2.5  $\mu$ ). Paraphyses numerous, sub-hyaline, 2–2.5  $\mu$  thick, exceeding the asci; at the tips, yellowish, sub-clavulate, 4–5  $\mu$  thick, conglutinate. Spores monostichous, oblong or sub-ellipsoid, broadly rounded at the ends, not tapering towards the ends or tapering slightly, slightly constricted at the septa, dark reddish brown, becoming opaque, 30–40  $\times$  10–12  $\mu$ .

on branches, Somerset East, MacOwan 1262, 1264, 1265, 1339; Witte Rivier, Dunbrody, Uitenhage distr., Hoeg 97 (Wakefield l.c.); Woodbush, N. Transvaal, K. M. Putterill, 31035.

I have not been able to trace MacOwan's specimens, which are all missing from our collections.

192. *Scolecopeltis Eugeniae* Doidge nov. sp.

Perithecia hypophylla, sparse, superficialia, facile secedentia opace atro-coerulea, rotundato-scutellata, tenuissime albo-marginata, 450–550  $\mu$  lata, margine in alam membranacearum 100–120  $\mu$  latam sensim tenuiore et pallidiore ambituque hyalinem abeunte, ex hyphis tenuibus 1–1.5  $\mu$  latis reticulatim denseque conjunctis texta, ostiolo distincto



rotundata 45–60  $\mu$  lato; asci numerosi, primitus oblongo-clavati, deinde ellipsoidei v. cylindracei, sub-sessiles, 150–160  $\times$  25–30  $\mu$ , ubique crassiuscule tunicati, apice haud incrassati, 4–8-spori; sporae paralleles, anguste clavatae, hyalinae, utrinque rotundatae, 90–120  $\mu$  longae (? maturae) supra latiores, 6.5–8.5  $\mu$  latae, deorsum sensim attenuatae, infra 3.5  $\mu$  latae, valde constrictae et facile secedentes, 4–6-septatae, cellulis sub-globosis.

Hab. in foliis *Eugeniae Zeyheri* Harv., Alexandria, leg. Doidge, 22349.

Ascomata hypophyllous, scattered, superficial, readily becoming detached from the leaf surface, black with a thin white margin, more or less circular in outline, 450–550  $\mu$  diam. Covering membrane scutellate, opaque in the centre near the distinct round pore which is 45–60  $\mu$  diam., pellucid, blue grey or indigo blue near the margin, becoming gradually paler outwards, and thinning out into a hyaline membranous border 100–120  $\mu$  broad; covering membrane composed of delicate hyphae 1–1.5  $\mu$  thick, which are densely and closely reticulate and interwoven. Asci numerous, 2–8-spored, at first oblong-clavate, then ellipsoid or cylindrical, sessile or sub-pedicellate, rounded above, 150–160  $\times$  25–30  $\mu$ , rather thick-walled, wall 1.5–2  $\mu$  thick, not thickened at the apex. Spores parallel, twisted, narrow clavate, hyaline, rounded at both ends, 90–120  $\mu$  long, 6.5–8.5  $\mu$  broad near the upper end, and tapering gradually downwards to 3.5  $\mu$  at the lower end; 4–6-septatae, mostly 5-septate, deeply constricted and falling apart readily; cells sub-globose. Paraphysoids hyaline, poorly developed.

on leaves of *Eugenia Zeyheri* Harv., Alexandria, Cape, Doidge, 22349.

### 193 *Scolepeltis Morganae* Doidge nov. sp.

Perithecia plerumque hypophylla, opace atro-coerulea, sparsa, superficialia, facile secedentia, 400–450  $\mu$  lata, margine in alam membranacearum hyalinem, 50  $\mu$  latam ambitu abeunte, ex hyphis 2–2.5  $\mu$  latis maeandrice denseque conjunctis contenta, ostiolo distincto nullo, in maturitate centro irregulariter radiatim dehiscentia. Asci numerosi, lanceolati v. fusiformi, 4–8-spori, recti v. curvati, apice rotundati, haud v. vix incrassati, sessiles, 80–90  $\times$  20–22.5  $\mu$ . Sporae primo 2–3-stichae, deinde paralleles, hyalinae, clavatae, 5-septatae, constrictae, 40–65  $\mu$  longae, supra conico-rotundatae, 4–7.5  $\mu$  latae, deorsum sensim attenuatae, infra 2–3  $\mu$  latae, facile in articulos inaequales secedentes.

Hab. in foliis *Mysinis africanae*, Woodbush, leg. Morgan et Doidge, 30487.

Ascomata mostly hypophyllous, opaque, blue-black, scattered, superficial, easily becoming detached from the leaf, 400–450  $\mu$  diam., surrounded by a hyaline zone which is up to 50  $\mu$  broad. Covering membrane scutellate, opaque in the centre, sub-pellucid bluish-green near the margin, becoming paler and thinning out rather rapidly into a hyaline, membranous border; not radiating in structure, composed of a close and intricate network of hyphae 2–2.5  $\mu$  thick; there is no central pore, at maturity a number of irregularly radiating cracks develop from the centre of the covering membrane. Asci numerous, lanceolate to fusiform, 4–8-spored, straight or curved, rather thin-walled, wall about 1  $\mu$  thick, not thickened at the apex or very slightly so, rounded above, sessile, 80–90  $\times$  20–22.5  $\mu$ . Spores at first 2–3-stichous, then parallel, hyaline, clavate, 5-septate, rounded conical at the apex, tapering gradually towards the base, constricted at the septa, 40–65  $\mu$  long; 4–7.5  $\mu$  broad near the second cell from the upper end, where the spore is broadest, tapering gradually to the lower end where it is 2–3  $\mu$  broad; readily breaking up into unequal segments, the lower cells being longer and narrower than the upper. Paraphysoids poorly developed, hyaline, filiform.

on leaves of *Mysine africana* L., Woodbush, Pietersburg distr., Transvaal, Morgan and Doidge, 30487.

### 194. *Scolepeltis Mysinis* Doidge, nov. sp.

Ascomata plerumque hypophylla, sparsa, superficialia, facile secedentia, atro-coerulea 600–750  $\mu$  diam., margine pallidiore in alam membranacearum usque 375  $\mu$  latam statim abeunte, scutellata, ubique ex hyphis 2–2.5  $\mu$  crassis maeandrice denseque conjunctis

contexta. Asci numerosissimi, 2-4-spore, clavati v. cylindracei, sessiles, recti v. curvati  $150-220 \times 22-25 \mu$ , pariete ca.  $1.5 \mu$  crasso, apice haud v. leniter incrassato. Sporae clavatae v. oblongae, utrinque rotundatae, hyalinae, 3-septatae  $60-102.5 \mu$  longae, supra  $7.5-11.5 \mu$  latae, deorsum sensim attenuatae, infra  $5-7.5 \mu$  latae.

Hab. in foliis *Myrsinis africanae*, Woodbush, leg. Morgan et Doidge, 30486.

Ascomata mostly hypophyllous, scattered, superficial, easily becoming detached from the leaf surface, blue-black,  $600-750 \mu$  diam., surrounded by a conspicuous white margin up to  $375 \mu$  broad. Covering membrane scutellate, with a distinct, sub-circular, central pore about  $75 \mu$  diam., opaque, blue-black almost to the margin, where it is bluish-green, subpellucid; firmly compacted of closely interwoven hyphae  $2-2.5 \mu$  thick, becoming paler and thinning out rather rapidly at the margin into a broad, hyaline, membranous border. Asci extremely numerous, 2-4-spored, clavate to cylindrical, sessile, broadly rounded above, straight or curved,  $150-220 \times 22-25 \mu$ ; wall usually about  $1 \mu$  thick, not thickened at the apex or slightly so, up to  $6 \mu$ . Spores mostly clavate, less frequently oblong, rounded at both ends, hyaline, 3-septate,  $60-102.5 \mu$  long; the second cell from the upper end is usually the broadest,  $7.5-11.5 \mu$  broad, and the spore tapers gradually towards the lower end which is  $5-7.5 \mu$  thick. It is possible that there are sometimes more than four spores in the ascus; the number is difficult to estimate in the mature ascus, as the spores fall apart within the ascus into cylindrical or ellipsoid or clavate segments, when they are barely mature. Paraphysoids numerous, very fine, hyaline.

on leaves of *Myrsine africana* L., Woodbush, Pietersburg distr., Transvaal, Morgan and Doidge, 30486; associated with *Sc. Morganae* and often on the same leaves.

#### 195. *Scolecopeltis Strauchii* Doidge nov. sp.

Perithecia hypophylla, sparsa, superficialia, facile secedentia, opace atro-coerulea, rotundato-scutellata,  $450-660 \mu$  lata, margine coerulee pellucido et sensim hyalino abeunte; ubique ex hypbis  $2-2.5 \mu$  latis maeandrice denseque conjunctis contexta, ostiolo distincto subrotundato  $40-45 \mu$  lato; asci pseudoparaphysati, 2-8-spore, ellipsoidei, breviter pedicellati, recti v. curvati,  $90-120 \times 20-24 \mu$ ; sporae in asco paralleles, longitudine fere ascorum, hyalinae, utrinque attenuatae, apice rotundatae, 10-12-septatae, constrictae, facile in articulos secedentes, cellulis inaequalibus.

Hab. in foliis *Pleurostyliae capensis* Oliv., Alexandria, leg. Doidge et Strauch, 22371.

Ascomata hypophyllous, scattered, superficial, easily detached from the leaf surface, greenish-black, opaque, round to irregular in outline,  $450-660 \mu$  diam. Covering membrane scutellate, opaque in the centre, pellucid dull bluish-green near the margin and becoming gradually hyaline towards the outer edge; not radiating in structure, but composed of reticulately and tortuously interwoven hyphae  $2-2.5 \mu$  thick; with a distinct sub-circular central pore  $40-45 \mu$  diam. Asci very numerous, 2-8-spored, ellipsoid, straight or curved, tapering towards both ends, rounded at the apex, contracted suddenly at the base into a short foot; wall firm, about  $1 \mu$  thick, not thickened at the apex or very slightly so;  $90-120 \times 20-24 \mu$ . Spores parallel, straight or slightly twisted and almost the length of the ascus, hyaline, narrow fusiform,  $75-100 \mu$  long;  $6-8.5 \mu$  thick in the centre and tapering to both ends which are rounded or sub-acute, 10-12-septate, constricted, falling apart very readily at the septa. Paraphysoids numerous, filamentous, hyaline, forming erect masses between the asci which partially isolate them.

on leaves of *Pleurostylia capensis* Oliv., Alexandria, Cape, Doidge and Strauch, 22371.





# THE SOUTH AFRICAN SPECIES OF ERYTHRINA.

By  
D. G. Collett.

The genus *Erythrina*, as represented in South Africa, comprises plants ranging from shrubs to tall trees. The species generally have large and trifoliate leaves and showy flowers, while several have a large rootstock. Their distribution is predominantly eastern and their occurrence south-west of the Albany district is rare though *E. caffra* is said to thrive well in cultivation in the Cape Peninsula. There are, too, records of the genus from West Africa. A plant which flowered in the Natal Herbarium garden (D. 17675) is said to have been grown from seed sent from West Africa by Colonel G. Molyneux, while Galpin collected a specimen near Windhoek (Galpin 14213 in National Herbarium), adding a note that only one plant was seen.

In the following account one species dealt with is known only in cultivation, viz.: *E. Crista-galli* Linn. The flowering shoots of this species die off annually and it requires a considerable length of time for a plant to attain to the height of a tree. Noteworthy, too, is the absence of a definite peduncle, the small groups of pedicelled flowers frequently springing from the axils of the upper leaves. Other cultivated species include *E. constantriana* Micheli, *E. micropteryx* Poepp., *E. corallodendron* Linn., *E. breviflora* DC., all from the Durban Botanic Gardens, but as they are represented in most cases by only a single specimen they are not included in the present descriptions. Two other specimens which flowered in the Natal Herbarium grounds and as yet unnamed, are said to have been grown from seed brought by Colonel Molyneux from East and West Africa.

Of the remaining species the occurrence of *E. acanthocarpa* E. Mey., the Tambokkie Thorn, is limited to the Queenstown-Tarkastad-Cathcart area of the eastern Cape Province where these shrubs are said to form dense thickets. This species is distinguished by its green-tipped, scarlet flowers, spinous legume, and comparatively small leaflets, and has a long succulent "root." According to Marloth the tissue of this underground rhizome is filled with water as a reserve against prolonged drought.

The species with the tallest trees, sometimes up to 60 feet high, is *E. caffra* Thunb., the Kaffirboom. Although the brilliant scarlet flowers appear before the foliage, the patches of red form an attractive picture against the background of grassy plains on which the trees are often to be found. In the warm, subtropical climate of Natal the flowers appear earlier than they do further south in the Albany district, sometimes before the end of June when the foliage of the previous season has not yet entirely disappeared. Pegler states that natives regard the flowering of this tree as a sign to begin ploughing. Bayer in "An Account of the Plant Ecology of the Coastbelt and Midlands of Zululand" (Annals of the Natal Museum, Vol. VIII) observes that *E. caffra* becomes established under the shade of the palm, *Phoenix reclinata*. He further cites this species in a list of plants typical of the forest margin which do not occur within the forest itself, being killed out as a result of over-shadowing by taller forest trees.

Hutchinson (Kew Bulletin, 1933) has recognised a species *E. lysistemon*, found in the Transvaal and formerly included in *E. caffra*, from which, however, it is distinguished by the possession of a vexillary stamen quite free from the split staminal-tube. Though this species may be confined to the Transvaal, *E. caffra* also occurs within this territory.

*E. latissima* E. Mey. is a stout branching tree cited by Bayer (An Account of the Plant Ecology of the Coastbelt and Midlands of Zululand) as a constituent of open tree veld.

On the grassy hill slopes of Natal these scattered trees, 15–20 feet high, are conspicuous for their robust appearance. Smaller than this are the shrubby species *E. Humeana*, Spreng. and *E. Zeyheri* Harv., easily distinguishable by the coarser appearance of the latter with its larger and more prickly leaves and larger stipules. *E. Zeyheri* has a large, corky underground stem and extends inland further west than *E. Humeana*.

Economically the genus is not important. Because *E. caffra* is easily propagated vegetatively, it is employed in the construction of live fences round kraals, and with other species is cultivated for ornamental purposes. Burt-Davy in "A Manual of the Flowering Plants and Ferns of the Transvaal with Swaziland" affirms that the very light underground stem of *E. Zeyheri* has been used as a substitute for cork, and dried and smoked as a remedy for asthma. Watt and Breyer-Brandwijk (The Medicinal and Poisonous Plants of Southern Africa) state that a leaf paste of *E. caffra* is one of the ingredients of a poultice applied by the Zulus over the bladder in suspected disease of that organ, the skin being greased before application. A similar poultice is used in the local treatment of venereal sores. The same authors declare that a decoction of the root of *E. Humeana* is used as a fomentation, and by the mouth in tuberculosis. It is sometimes used for other chest conditions, e.g. bronchitis, while the Zulus and Swazis use the bark of *E. Zeyheri* as an ingredient in a decoction taken by the mouth for rheumatism, boils, and "blood disorders".

According to Watt and Brandwijk, seed of *E. Zeyheri* yields 28 per cent. of a fixed oil which is purgative and 4 per cent. of a volatile oil containing an alkaloid now generally known as *zeyherine*, previously as *erythrine*. This alkaloid has been recommended for tuberculosis. The volatile oil also contains *erythrol* which has a pungent odour like horse-radish and is a powerful irritant. It can be used in a liniment for counter-irritation. The Union Division of Forestry has received enquiries from America concerning the availability of seeds of *Erythrina* spp. for which a demand is anticipated if the extraction of their alkaloids proves successful. The coral red seeds are utilised by Kaffir women in the manufacture of necklaces.

Acknowledgment is made to the following herbaria for the loan of specimens: Transvaal Museum, Pretoria (T. M.), Natal Herbarium, Durban (D.), Albany Museum, Grahamstown (G.).

In conclusion I express my gratitude to Dr. E. P. Phillips, Chief of the Division of Botany and Plant Pathology, and to Dr. R. A. Dyer for their sympathetic assistance while I was engaged in this work.

### *Erythrina* Linn. Sp. Pl. ed. I. 706 (1753).

*Coraliodendron* Mill. Gard. Dict. Abrdg. ed. 4 (1754).

*Mouricou* Adans. Fam. II. 325 (1763).

*Xyphanthus* Rafn. Fl. Ludov. 103 (1817).

*Chirocalyx* Meisn. in Hook. Lond. Journ. Bot. II. 97 (1843).

*Micropteryx* Walp. in Linnaea, XXIII. 739 (1850).

*Duchassaingia* Walp. l. c. 741.

*Macrocybium* Walp. in Flora, XXXVI. 194 (1853).

*Stenoptropis* Hasskarl Retzia, I. 183 (1855).

*Hypaphorus* Hasskarl Hort. Bogor. I. 197 (1858).

Shrubs or trees ranging from 0.3 m. to 17 m. in height. *Stem* generally woody and branched, but subterranean and corky in *E. Zeyheri*; branches woody, leafy, armed with prickles, glabrous or tomentose, but then becoming glabrous with age. *Leaves* pinnately 3-foliate, alternate, petioled, often arising in clusters at the apex of the stem in *E. Zeyheri*, in the other species generally scattered along the branches or sometimes clustered towards the ends of the branchlets; leaflets with or without prickles on the veins on one or both surfaces, eventually glabrous but sometimes tomentose when young; petiole terete and without furrows or furrowed, armed or unarmed, tomentose, puberulous or glabrous; terminal leaflet ovate, obovate, elliptic or ovate long-acuminate, sometimes broader than

long, obtuse to acute, rarely apiculate, with a pair of basal glands; petiolule of terminal leaflet frequently armed with prickles, white-tomentose, puberulous, or glabrous; lateral leaflets ovate, obovate, elliptic or ovate long-acuminate, occasionally broader than long, obtuse to acute, very rarely apiculate, sometimes unequal-sided, with a pair of glands at the base. *Stipules* ovate, oblong or linear, white tomentose, pubescent or glabrous. *Peduncle* woody, naked, often furrowed, armed or unarmed, tomentose to puberulous, but becoming glabrous with age. *Racemes* terminal and densely, or rarely lateral and laxly, many-flowered except in *E. acanthocarpa* where the short racemes are few-flowered. *Flowers* brilliant scarlet to dull crimson, tipped with green in *E. acanthocarpa*, showy, frequently pendulous, appearing before or with the leaves. *Bracts* ovate, ovate-rotund, oblong or linear-obovate, densely tomentose to puberulous, deciduous; bracteoles linear, woolly-villous to puberulous, frequently deciduous. *Calyx* tubular to campanulate, 2-lipped or sub-truncate, frequently obscurely 5-lobed, very rarely as broad as long, in *E. latissima* ovate or obovate and with the tube cleft below nearly to the base and the upper lip produced into 5 apical linear or linear-lanceolate lobes, densely woolly-villous to puberulous, but glabrous in *E. Crista-galli*. *Vexillum* ovate, obovate, elliptic, oblong-obovate or elliptic-oblong, obtuse, frequently emarginate, with a short basal claw, glabrous, sometimes minutely velvety; keel roughly ovate, obovate or oblong, acuminate in *E. acanthocarpa*, sometimes truncate and with a lateral mucro above, in *E. Humeana* frequently with a lateral lobe, keel petals sometimes free, shortly narrowed at the base, very rarely not narrowed; wings ovate or roughly oblong to obovate, frequently curved and narrowing slightly above, shortly clawed at the base, longer or shorter than the keel, with a ventro-lateral lobe on each side in *E. acanthocarpa*. *Stamens* diadelphous, with the filaments free above and united into a split tube below except the vexillary filament which is free to its base in *E. lysistemon* but is united to the staminal-tube for varying lengths in the other species; anthers linear, 2-theous, dehiscing by longitudinal slits, dorsi-fixed. *Ovary* linear, many-ovuled, densely tomentose, on a gynophore; style linear, hispid below, glabrous above, rarely glabrous along its whole length; stigma small, simple, terminal. *Pods* (in those species seen) dark, subligneous, stalked, falcate, armed with prickles only in *E. acanthocarpa* constricted between the seeds and with these constrictions frequently elongated. *Seed* red, elliptic, with a scar of attachment.

#### KEY TO THE SPECIES.

- |   |                            |
|---|----------------------------|
| 1. Peduncle and calyx whitish woolly-villous; calyx with 5 apical linear lobes, cleft nearly to the base on the lower side.....                       | 1 <i>E. latissima</i> .    |
| Peduncle and calyx not woolly-villous; calyx sub-truncate or 2-lipped, but not cleft to the base.....   | 2                          |
| 2. Keel almost as long as the vexillum.....   | 7 <i>E. crista-galli</i> . |
| Keel about $\frac{1}{2}$ to $\frac{1}{3}$ as long as the vexillum.....  | 3                          |
| 3. Calyx distinctly 2-lipped.....   | 4                          |
| Calyx truncate or almost so.....  | 5                          |
| 4. Vexillary stamen free to the base, possibly adhering to, but not adnate to, the split staminal-tube.....   | 2 <i>E. lysistemon</i> .   |
| Vexillary stamen adnate to the split staminal-tube for about 1 cm. below..  | 3 <i>E. caffra</i> .       |
| 5. Terminal leaflet obovate, less than 5 cm. long; keel longer than the wings; legumes spinous.....   | 4 <i>E. acanthocarpa</i> . |
| Terminal leaflet ovate or elliptic, rarely obovate, usually 5 cm. or more long; keel shorter than the wings; legumes unarmed.....                     | 6                          |
| 6. Filaments free above for at least half the length of the longest stamens; leaflets sometimes with a few prickles on the veins beneath.....         | 5 <i>E. humeana</i> .      |
| Filaments free for less than half, about $\frac{1}{3}$ the length of the longest stamens; leaflets well armed with prickles on the veins beneath..... | 6 <i>E. zeyheri</i> .      |



1. *E. latissima* *E. Mey.* Comm. Pl. Afr. Austr. 151 (1835).

*Chirocalyx mollissimus* Meisn. in Hook Lond. Journ. Bot. II. 98 (1843).

*Erythrina sandersoni* Harv. Thes. Cap. I. 39 (1859).

*E. tomentosa* R. Br. sec. Wood Natal Plantar. IV. iv. tab. 384-385 (1906), non R. Br.

*E. abyssinica* Lam. sec. Marloth Fl. South Afr. II. 1. 81 (1925), non Lam.

A tree, 3-7 m. high. *Branches* woody, armed with prickles, densely tomentose, becoming glabrous with age. *Leaves* with the veins of the leaflets occasionally armed with prickles, generally unarmed, variously pubescent, sometimes puberulous or at first densely tomentose above and below but becoming glabrous with age, the upper surface losing its tomentum first; petiole woody, 13-30 cm. long, up to 0.9 cm in diam., shallowly furrowed, unarmed, densely whitish tomentose to puberulous, becoming glabrous with age; terminal leaflet 5.5-30 cm. long, 7.5-31.5 cm. broad, broadly ovate, broader than long, obtuse; petiolule of terminal leaflet 5-16.5 cm. long, densely whitish-tomentose to puberulous, becoming glabrous; lateral leaflets 7-21 cm. long, 7-21.5 cm. broad, broadly ovate, frequently broader than long, obtuse, unequal-sided. *Stipules* ovate, densely white-tomentose. *Peduncle* 12-24 cm. long, not furrowed, unarmed, at first densely white-tomentose, becoming glabrous. *Raceme* terminal, densely many-flowered, 4-8 cm. long. *Flowers* dull crimson, showy, erect when in bud, but becoming pendulous as they mature. *Bracts* membranous, 1.2-2 cm. long, linear-obovate, densely white-tomentose; bracteoles up to 2 cm. long, linear, woolly-villous. *Pedicel* 0.4 cm. long, densely villous. *Calyx* 3-4.1 cm. long, 0.8-1.1 cm. diameter across the middle of the tube, ovate or obovate, with the tube cleft nearly to the base on the lower side and the upper side produced into 5 apical linear or linear-lanceolate lobes about 1/3 length of the calyx, densely woolly-villous. *Vexillum* 3.1-6.3 cm. long, 1.5-2.7 cm. broad across the middle, elliptic or oblong-obovate, obtuse, emarginate, with a short basal claw, glabrous; keel 1.3-1.9 cm. long, 1-1.4 cm. broad across the middle, keel petals free, obovate, shortly narrowed at the base; wings 1.7-2.8 cm. long, 0.8-1 cm. broad at the middle, obovate-oblong, curved, narrowed at the base, longer than the keel. *Filaments* 2.8-5.2 cm. long, vexillary filament free to the centre of the staminal-tube, the rest free above for approximately 1/3 the length of the longest stamens; anthers 2.5-4 mm. long. *Ovary* 1.5-2 cm. long; style 1.2-2 cm. long, linear, hispid below, glabrous above; stigma capitate.

**Cape Province:** Kentani district, *Pegler* 235, Sept., 1903, Oct., 1907 (N.H., G.); Umzimkulu district, Clydesdale, *Tyson* 1053 (N.H.)

**Natal:** Umzinto district, Ifafa, *Lansdell* (N.H. 16114); Durban district, Port Natal, *Krauss* 263 (N.H. 9326); unknown collector, *N.H.* 14466; Zululand, *Harris* (D. 28844).

**Swaziland:** Mbabane district, *Nicholson* (N.H. 22996).

**Transvaal:** Barberton district, Logogotu, *Holt* 334 (N.H.).

The following specimens consisting of leaves only may belong to this species:—

**Transvaal:** Barberton district, Barberton, *Smith* 7051 (N.H.), *Oranje in Herb.* Burt-Davy (N.H. 23296), Nelspruit, *Mogg* 13979 (N.H.); Pietersburg district, Houtboschberg, *Nelson* 382 (T.M. 11626).

The identity of the following specimens is doubtful. Possibly they should be included under *E. latissima*:—

**Cape Province:** Transkei, *Miller* (N.H. 23297).

**Transvaal:** Pietersburg district, Woodbush, *Hoffmann* 143 (T.M. 30424).

The following are cultivated specimens:—

**Natal:** Durban, in Botanic Gardens, *Wood* (D. 3579).

**Cape Province :** Kingwilliamstown, grown from seeds from Umtata, *Sim* 1362 (N.H.). This specimen probably belongs here.

**Transvaal :** Pretoria, cultivated in Division of Botany and Plant Pathology gardens, origin unknown, *Collett* (N.H. 24192).

The species, as here represented, is very variable as regards vegetative features, the amount of tomentum on the leaves in particular presenting a problem, the solution to which probably be found only by an examination of material in the field. It is possible that distinct species exist. However, because the floral structure appears uniform and use the dried herbarium material available does not warrant the creation of an additional species, the specimens formerly known as *E. latissima* E. Mey. have been left under that name.

***E. lysistemon* Hutch. in Kew Bull. 1933, 422.**

A tree up to 7 m. high. *Stem* woody, branched; branches woody, leafy, covered with prickles. *Leaves* scattered or clustered towards the ends of the branchlets, unarmed, glabrous; petiole about 8.5 cm. long, shallowly furrowed, sometimes armed with one or two prickles, puberulous when young but becoming glabrous; terminal leaflet 9.5 cm. long, 8.5 cm. broad, broadly ovate, long acuminate, narrowing at the base, subobtuse; petiole of terminal leaflet about 4 cm. long, sometimes bearing one or two prickles when young; lateral leaflets 8-9 cm. long, 6.5-8 cm. broad, broadly ovate, long acuminate, narrowing at the base, sub-obtuse, unequal-sided, with a pair of basal glands. *Stipules* 1-2 cm. long, ovate, pubescent when young, becoming glabrous, deciduous. *Peduncle* 1-2 cm. long, faintly furrowed, unarmed, pubescent at first, becoming glabrous. *Racemes* terminal, densely many-flowered, 2-6 cm. long. *Flowers* red, showy, pendulous, appearing before the leaves. *Bracts* ovate, pubescent, deciduous; bracteoles minute, linear, pubescent. *Calyx* 0.2 cm. long. *Calyx* 1-1.4 cm. long, 0.7-0.9 cm. diameter above, campanulate, 2-lobed, upper lip sometimes shallowly 2-fid, tomentose. *Vexillum* 2.4-5.9 cm. long, 2-2.1 cm. broad across middle, obovate or elliptic, obtuse, sometimes emarginate, with very short basal claw, glabrous; keel 0.7-1 cm. long, 0.3-0.5 cm. broad across the middle, oblong to obovate, narrowed at the base; wings 1-1.1 cm. long, 0.3-0.4 cm. broad across the middle, roughly oblong, narrowing above, curved, narrowed at the base, not longer than the keel. *Filaments* 2-3.6 cm. long, with the vexillary filament free at the base, possibly adhering to, but not adnate to, the split staminal-tube, and with the remaining filaments free for 0.7-1.1 cm. above; anthers 0.25 cm. long. *Ovary* 1-1.7 cm. long; style 0.9-1.7 cm. long, linear, hispid; stigma small, capitate. *Pods* stalked, constricted between the seeds, almost glabrous.

**Transvaal :** Belfast district, Crocodile River, *Smuts* 66 (N.H. 24193, **Type**); Pretoria district, Silverton, *Leemann* (N.H. 22845); Zoutpansberg district, Wylies Poort, *Taylor* (N.H.).

Possibly the following two specimens belong to this species, the vexillary filament appearing to be not typically adnate and yet not distinctly free as in the above three species:—

**Swaziland :** *Stewart* (T.M. 8924).

**Transvaal :** Barberton district, near Barberton, *Legat in Herb. Burt-Davy* (N.H. 26303).

***E. caffra* Thunb. Prodr. Pl. Cap. 121 (1800).**

***E. caffra* Todaro Nouvi Generi e Nuove Specie di Piante 62 (1861).**

***E. insignis* Todaro l c. 66.**

A tree 7-17 m. high. *Stem* woody, branched; branches woody, leafy, armed with prickles. *Leaves* scattered or clustered at the ends of the twigs, unarmed, glabrous.

petiole 6-16 cm. long, furrowed, sometimes with one or two small prickles when young but unarmed when mature, puberulous when young, becoming glabrous; terminal leaflet 8-16 cm. long, 8-18 cm. broad, broadly ovate, occasionally elliptic, frequently broader than long, subacute; petiolule of terminal leaflet 3-8 cm. long, unarmed; lateral leaflet 7.5-13 cm. long, 5-12 cm. broad, ovate, subacute, unequal-sided. *Stipules* minute, ovate, puberulous, deciduous. *Peduncle* 9-18 cm. long, terete, unarmed, tomentose when young, becoming glabrous. *Racemes* terminal, densely many-flowered, 2-4.5 cm. long, rarely half the length of the peduncle. *Flowers* brilliant scarlet, showy, pendulous, appearing before the leaves. *Bracts* membranous, ovate, pubescent, early deciduous; bracteoles minute, linear, pubescent. *Pedicel* 0.2-0.6 cm. long, pubescent. *Calyx* 1-1.9 cm. long, 0.8-1.2 cm. diameter above, campanulate, 2-lipped, becoming broader and splitting more deeply with age, tomentose. *Vexillum* 3.5-5.4 cm. long, 1.4-2.8 cm. broad across the middle, obovate or elliptic, obtuse, sometimes emarginate, with a short basal claw, glabrous; keel 0.8-2.1 cm. long, 0.4-1.4 cm. broad across the middle, roughly oblong, ovate or obovate, shortly narrowed at the base; wings 0.9-2.4 cm. long, 0.3-1.1 cm. broad across the middle, roughly oblong or obovate, narrowing slightly above, frequently curved, narrowed at the base, slightly longer than the keel. *Filaments* 2.9-5.1 cm. long, with the vexillary filament adnate for 1-1.8 cm. below and the rest free for 0.9-1.5 cm. above; anthers 3-4.5 mm. long. *Ovary* 1.4-2.7 cm. long; style 1.7-3.2 cm. long, hispid below, sometimes glabrous above; stigma simple, capitate. *Pods* black, subligneous, about 12 cm. long, stalked, unarmed, deeply constricted between the seeds and with these constrictions frequently elongated, densely tomentose when young, becoming glabrous when old. *Seeds* bright red, elliptic, with a linear scar of attachment.

**Cape Province:** Bathurst district, Kleinemund River, *MacOwan* 1434 (G.); Albany district, Grahamstown, Howieson's Poort, also Port Alfred, *Galpin* 67 (N.H., G.); Kingwilliamstown district, Pirie, *Sim* 2135 (N.H.); Komgha district, near Komgha, *Flanagan* 319 (N.H.); Kentani district, *Pegler* 89 (N.H., G., collected various dates), *Pegler* 1134 (N.H.).

**Natal:** Durban district, Durban, *Thode* A1514 (N.H. 18213), Berea, *Wood* 10016 (N.H. D. 10306), *Forbes* 350 (D. 18392), *Lansdell* (N.H. 1455); Camperdown district, Cato Ridge, *McClean and Ogilvie* (D. 27899); Zululand, Eshowe, *Rogers* 24455 (T.M. 24020), Mtunzini, *Thode* A1528 (N.H. 18227), St. Lucia Bay, *Pole Evans* 3648 (N.H.), Zululand, Farm Egoa, *Curson* (N.H. 23016).

**Transvaal:** Barberton district, Saddleback Range, *Galpin* 494 (N.H., G.); Lydenburg district, Lydenburg, *Barnard* 534 (N.H.); Pretoria district, Pretoria, *Leendertz* 217 (G., T.M. 8334), Water Tower Hill, *Mogg* 15157 (N.H.); Pietersburg district, Woodbush, *Jenkins* (T.M. 7339); Zoutpansberg district, Louis Trichardt, *Breyer* (T.M. 24377).

The following specimen was grown in the garden of the Division of Botany and Plant Pathology, Pretoria:—

**Transvaal:** *Phillips* (N.H. 1648).

In the National Herbarium are records of two forms of this species with pink and yellow flowers. One was collected at Mbabane in Swaziland (*Nicholson* in N.H. 22847) and the other is a specimen from a plant cultivated in the Native Garden, Willowvale district (Forest Dept. Herb. 8865).

Pink-flowered specimens are also found growing in the Durban Botanic Gardens and in the garden of the Natal Herbarium. As it is not certain whether these "sports" occur wild as well as in cultivation, the creation of a variety is not yet justified. Marloth states that the occasional occurrence of these pale-coloured flowers is due to the absence of the red pigment in the epidermal cells. This explanation, of course, does not exclude the possibility of the "sport" being an inheritable mutation.



It is impossible to tell whether the following incomplete specimens should be included in *E. caffra* Thunb. or in *E. lysistemon* Hutch:—

**Transvaal:** Barberton district, Nelspruit, *Pole Evans* 3927 (N.H.); Pilgrims Rest district, Bushbuck Ridge, *Smuts and Gillett* 2344X (N.H.); Pretoria district, Schanskop, *Mogg* 15742 (N.H.); de Wildt, *Murray* (N.H. 23298), Wonderboompoort, *Leendertz* 953 (T.M. 8335); Rustenburg district, Rustenburg, *Leendertz* 3304 (T.M. 9801), *Turner* 1b (N.H.); Pietersburg district, Woodbush, *Hoffmann* 24 (T.M. 29179); Zoutpansberg district, *Bailey in Herb. Burt-Davy* (N.H. 26302), *Smuts* (N.H. 23299), Baiandbai, *Lang* (T.M. 32266).

**E. Humeana** Spreng. sec. Eckl. & Zeyh. Enum. Pl. Afr. Austr. Extratrop. 259 (1835), non Spreng.

A rigid shrub, 1–2 m. high. *Root* long and succulent, very light when dry. (Fl. Cap. II, 237). *Stem* woody, branched; branches woody, leafy, covered with recurved prickles. *Leaves* scattered along the branches and with or without a prickle at the base of the petiole, with the mid-rib armed with one or two small prickles beneath, pubescent when young becoming quite glabrous; petiole slender, 2–4 cm. long, armed with 2 or 3 recurved prickles, puberulous; terminal leaflet 3–3·5 cm. long, 2·5–3·5 cm. broad, broadly obovate or transversely elliptic, very nearly as broad as long, or broader than long, triangular apiculate or rounded above; petiole of terminal leaflet 1·5–2·5 cm. long, with one or two prickles, puberulous; lateral leaflets 2·5–3·5 cm. long, 2–3 cm. broad, obovate to longitudinally elliptic, apiculate or sub-acute, frequently unequal-sided. *Stipules* minute, subulate, villous, deciduous. *Peduncle* 1–12 cm. long, sometimes furrowed, unarmed, tomentose when young, becoming glabrous. *Racemes* terminal or lateral, comparatively lax, few-to many-flowered, extending the whole, or nearly the whole, length of the peduncle. *Flowers* scarlet, tipped with green, erect or horizontal, appearing with the leaves. *Bracts* ovate-rotund; bracteoles linear, bracts and bracteoles minute, densely pubescent, deciduous. *Pedicel* 0·6–0·8 cm. long, pubescent. *Calyx-tube* 1·2–1·7 cm. long, 1–1·7 cm. diameter above, broadly campanulate, sometimes as broad as long, subtruncate, obscurely 5-lobed, pubescent. *Vexillum* 4·2–5·5 cm. long, 2·3–2 cm. broad across the middle, elliptic-oblong, obtuse, emarginate, with a very short basal claw, minutely velvety; keel 1–1·5 cm long, 0·2–0·4 cm. broad across the middle, ovate or triangular ovate, acuminate, shortly narrowed at the base; wings 0·4–0·6 cm. long, 0·2 cm. broad below, ovate-acuminate, with a ventro-lateral lobe on each side, narrowed at the base, shorter than the keel. *Filaments* 3·4–5·2 cm. long, the vexillary filament free nearly to the base and the rest free above for more than half the length of the split staminal-tube; anthers 3–4 mm. long. *Ovary* 1·6–2·6 cm. long, broadly linear; style 1·8–3·2 cm. long, linear, hispid below, glabrous above; stigma small, capitate. *Pods* woody, 10–25 cm. long, curved, constricted, or not between the seeds, covered with numerous small straight prickles, stalked, at first tomentose but glabrous when old.

**Cape Province:** Albany district, Grahamstown, Botanical Gardens, *Marsh* (G.); Queenstown district, Queenstown, *Pole Evans* (N.H. 2997), *Rogers* (G.), grassy plains, Queenstown, *Galpin* 1653, Oct.–Nov. 1893 (N.H., G.); Cathcart district, north of Cathcart near Tylden, also near Imvani, and along Queenstown road, plentiful along the Turkastad road from Queenstown near Carlsrust Siding and Bowkers Park, in thorn country only *Reynolds* 1606 (N.H.).

5. **E. Humeana** Spreng. Syst. Veg. III. 243 (1826).

**E. Humei** E. Mey. Comm. Pl. Afr. Austr. 150 (1835).

**E. hastifolia** Bertol. f. in Mem. Acc. Sc. Bolog. II. 568 (1850).

**E. Raja** Meisn. in Hook. Lond. Journ. Bot. II. 96 (1843).

**E. caffra** Thunb. sec. Ker-Gawl. Bot. Reg. IX. tab. 736 A, B (1823), non Thunb.

**E. caffra** Thunb. sec. Sims Bot. Mag. L. tab. 2431 (1823), non Thunb.

**E. caffra** Thunb. sec. DC. Prodr. II. 412 (1825), non Thunb.

**E. caffra** Thunb. sec. Reichb. Fl. Exot. V. tab. 312 (1836), non Thunb.

A shrub. *Branches* woody, leafy, armed with prickles. *Leaves* scattered along the branches, with the veins of the leaflets sometimes armed with a few small prickles on both surfaces or only on the lower, glabrous; petiole 5–14 cm. long, not prominently furrowed, bearing recurved prickles, puberulous when young; terminal leaflet 5–13 cm. long, 4·5–12 cm. broad, broadly ovate to elliptic, or ovate long-acuminate, sometimes broader than long, obtuse or sub-acute; petiole of terminal leaflet 3·5–9 cm. long, bearing prickles; lateral leaflets 4·5–13 cm. long, 4–8 cm. broad, ovate, elliptic, or ovate long-acuminate, sub-acute. *Stipules* 0·5–1 cm. long, ovate or linear, deciduous. *Peduncle* 20–48 cm. long, terete, rarely furrowed, sometimes bearing prickles, pubescent when young, becoming glabrous with age. *Racemes* terminal, densely flowered above, more laxly below, 6–10 cm. long, rarely longer, but lengthening as the fruits ripen. *Flowers* red, showy, pendulous, appearing with the leaves. *Bracts* ovate or oblong; bracteoles linear; bracts and bracteoles minute, puberulous, deciduous. *Pedice* 0·4 cm. long. *Calyx-tube* 0·9–1·3 cm. long, 0·6–0·8 cm. diameter above, tubular, subtruncate, shortly 5-lobed, puberulous. *Vexillum* 3·8–5 cm. long, 1·4–2·1 cm. broad across the middle, obovate or elliptic-obovate, obtuse, frequently emarginate, with a short basal claw, glabrous; keel 0·6–0·8 cm. long, 0·3–0·4 cm. broad, roughly oblong or ovate, narrowed at the base, frequently with a median or ventral lateral lobe and tapering above; wings 0·6–1·2 cm. long, 0·3 cm. broad across the middle, roughly oblong, narrowing above, curved, clawed at the base, longer than the keel. *Filaments* 3–3·4 cm. long, with the vexillary filament free almost to the base of the staminal-tube and the rest free for 1·7–2·3 cm. above, i.e. for at least half the length of the longest stamens; anthers 2 mm. long. *Ovary* 1·2–2 cm. long; style 1·5–1·9 cm. long, sparsely hispid; stigma small, terminal. *Pods* black, subligneous, 12–16 cm. long, stalked, unarmed, deeply constricted between the seeds, pubescent when young, becoming glabrous. *Seeds* red, elliptic, laterally compressed, with a scar of attachment.

**Cape Province:** Eastern Cape Province, *Drege* (N.H. 9325); Bathurst district, coast belt near Fish River Lighthouse, *Dyer* 2263 (G), Coombs Vale, *Bennie* (G.); Albany district, Southwell, *Schönland* (N.H. 22921), Botha's Hill, *MacOwan* (G); East London district, East London, *Galpin* 3388 (N.H.), "Overton", 11 miles west of East London, *Hilner* 161 (G.), Keiskama mouth, *Galpin* 7693 (N.H.), Stutterheim district, Fort Cunningham, *Sim* 2136 (N.H.); Komgha district, near Komgha, Flanagan 125, January, 1890, 1891 (N.H., G.); Kentani district, *Pegler* 1179 (N.H., G.).

**Natal:** Durban district, Umgeni, *Wood* 13078 (D.), Botha's Hill, *McClellan* 134 (N.H.), Intshanga, *Wood* 9776 (D., G.), New Germany, *Wood* 12652 (N.H.); Richmond district, Byrne, *Galpin* 11906 (N.H.); Greytown district, *Wylie* (D. 22344, T. M. 34029); Vryheid district, Gobeni Hills, *Pole Evans* 2637 (N.H.); Mount Ashley, *Mogg* 6360 (N.H.); Zululand, Somkeli district, *Wood* 9224 (N.H.).

**Swaziland:** Mbabane district, Mafutane, *Bolus* 11831 (N.H.).

**Transvaal:** Ermelo district, Billy's Vlei, *Burt-Davy* 9326 (N.H.); Carolina district, Steynsdorp, *Dieperink* 87 (N.H.); Pietersburg district, Zoekmekeer, *Botha* (N.H. 23017); Zoutpansberg district, Louis Trichardt, *Breyer* (T.M. 19416).

**Portuguese East Africa:** Lourenco Marques district, Rikatla, *Junod* (T.M. 20185).

The following scanty specimens should probably be included in this species:—

**Cape Province:** East London district, Southernwood, *Smith* 3642 (N.H.).

**Transvaal:** Barberton district, Barberton, *Rogers* (T.M. 24277).

Possibly the specimen marked "Bottom of Woest Hill, 466" (G) should be included here.

Cultivated specimens of this species include the following:—

**Cape Province:** "The Hill", Claremont, near Cape Town, *Marloth* 9337 (N.H.); Eastern Cape Province, originally from Port Alfred, flowered in Dr Becker's garden (G.).

**Transvaal:** Pietersburg district, Pietersburg, from the park, *Stapleton* (N.H. 22854, 22920).

**6. E. Zeyheri Harv. in Flor. Cap. II. 236 (1861-62).**

A shrub 0.3-0.5 m. high. *Stem* subterranean, corky. *Leaves* arising in clusters at the apex of the stem or from short terminal branches, with the leaflets prominently veined beneath and with the veins generally puberulous and armed with prickles on both surfaces or on the lower only; petiole 8-20 cm. long, often prominently furrowed, covered with recurved prickles, puberulous; terminal leaflet 10-26 cm. long, 8-21 cm. broad, but occasionally up to 30 cm. long and 25 cm. broad, broadly ovate or elliptic, rarely obovate, occasionally as broad as long, obtuse or subacute; petiolule of terminal leaflet 4-14 cm. long, bearing prickles; lateral leaflets 10-21 cm. long, 5-12 cm. broad, ovate to elliptic, obtuse to acute, frequently unequal-sided. *Stipules* coriaceous, 1-2 cm. long, ovate or oblong, glabrous, or occasionally puberulous. *Peduncle* 19-38 cm. long, often furrowed sometimes bearing a few small prickles, pubescent when young, becoming glabrous with age. *Racemes* terminal, densely many-flowered, 2.5-8 cm. long. *Flowers* red, showy, pendulous, appearing with the leaves. *Bracts* ovate or oblong, deciduous; bracteoles minute, linear, pubescent. *Pedice* 0.4 cm. long. *Calyx-tube* 1.2-1.5 cm. long, 0.7 cm. diameter across the middle, tubular-campanulate, sub-truncate, shortly 5-lobed, puberulous. *Vexillum* 3.4-4.4 cm. long, 1.4-1.9 cm. broad across the middle, obovate, obtuse, sometimes emarginate, with a short basal claw, glabrous; keel 0.7-1 cm. long, 0.4-0.5 cm. broad across the middle, roughly oblong or ovate, frequently truncate and with a lateral mucro above, narrowed at the base; wings 0.9-1.5 cm. long, 0.3-0.5 cm. broad across the middle, oblong to obovate, frequently curved, clawed at the base, longer than the keel. *Filaments* 3-4 cm. long, with the vexillary filament free nearly to the base of the staminal-tube and the rest free for about 1 cm. above, i.e. for  $\frac{1}{3}$  the length of the longest stamens; anthers 2 mm. long. *Ovary* 1.3-1.5 cm. long; style 1.6-2 cm. long, linear, sparsely hispid; stigma small, terminal. *Pods* dark, subligneous, 8-20 cm. long (Fl. Cap.), stalked, unarmed, constricted between the seeds and with these constrictions frequently elongated, pubescent when young, becoming puberulous. *Seeds* red, elliptic, with a linear scar.

**Natal:** Estcourt district, Mooi River, *Wood* 4076 (D. 4596); Weenen district, Mabelston, *Mogg* 3085 (N.H.); Dundee district, Amanga valley, native collector (N.H. 21765).

**Basutoland:** Mafeteng district, *Dieterlen* 547 (N.H.).

**Orange Free State:** Vrede district, Vrede, *Langham* (D. 12129); Senekal district, Doornkop, *Goossens* 810 (N.H.); between Senekal and Bethlehem, *Flanagan* 1827 (N.H.); Kroonstad district, Kroonstad, *Pont* 530 (N.H. 22840), near Valsch River, *Pont* 530 (N.H. 22841), East Hill, *Standard VII DI* (N.H. 22842).

**Transvaal:** Barberton district, Komatipoort, *Rogers* 12963 (T.M. 13737); Wakkerstroom district, Wakkerstroom, *van Dam* (T.M. 24352); Volksrust district, Volksrust, *Jenkins* (T.M. 9294); Ermelo district, Ermelo, *Hoffe* 16 (N.H.), Spitskop, *Pott* (T.M. 15084), on farm Nooitgedacht, *Henrici* 1210 (N.H.), Lake Chrissie, *Galpin* 710 (N.H.); Belfast district, Belfast, *Leendertz* 2681 (T.M. 8058); Bethal district, Bethal, *Leendertz* 3533 (T.M. 9331); Middelburg district, Middelburg, *Jenkins* (T.M. 9211), Witbank, Zondagsfontein, *Thode* A2799 (N.H. 19501, D. 26113), Klein Olifants River, *Young* A5 (T.M. 32510); Vereeniging district, Vereeniging, *Leendertz* 3899 (T.M. 10870), *Marloth* 8106 (N.H.); Pretoria district, on road to Tygerpoort, *Verdoorn* (N.H. 22839), Irene, *Pole Evans* (N.H. 22843) and *Leendertz* 693 (T.M. 8336), Fountains Valley, *Repton* 207 (N.H.), Scurfde Bergen, *Swaersstra* (T.M. 6231); Boksburg district, Boksburg, *Breyer* (T.M. 15005); Johannesburg district, Klipriviersberg, *Marloth* 3848 (N.H.); Potchefstroom district, on the grassy, stony hills and on the banks of the Mooi River, *Zeyher* 531 (N.H. 9324, G., *Type*), Klerksdorp district, Klerksdorp, *Nelson* 223 (T.M. 11617).



The following specimens almost certainly belong to this species but are too scanty for precise examination:—

**Natal :** Newcastle district, near Newcastle, *Saunders* (D. 3440).

**Basutoland :** Leribe district, *Dieterlen* 547 (D. 13910).

**Orange Free State :** Heilbron district, *Brandmuller* 126 (N.H.); Sand River Vals River, valleys of Witte Bergen, *Barber* 646 (G.).

**Transvaal :** Wakkerstroom district, Wakkerstroom, *Pole Evans* (N.H. 26304); Carolina district, Carolina, *Rademacher* (T.M. 7495, 7503), *Galpin* 12989 (N.H.), Standerton district, Standerton, *Jenkins* (T.M. 9940), New Denmark, *Burt-Davy* 999, (D. 9685); Benoni district, Benoni, *Bradfield* 296 (N.H.); Johannesburg district, Frankenwald, *Burt-Davy* 2577 (N.H.), Modderfontein, *Haagner* (G.); Ventersdorp district, Goedgedacht, *Stutton* 596 (N.H.).

The following are cultivated specimens belonging to this species:—

**Cape Province :** Somerset East district, Somerset East, cult. esum. Transgariepinis, *MacOwan* (G.); Queenstown district, Queenstown, plant collected at Boksburg, flowered in Botanical Gardens, *Galpin* 7370 (N.H.).]

*Galpin* 12989 cited above, exhibits the phenomenon of having two lateral leaflets attached on the same side of the petiole.

7. **E. Crista-galli** *Linn. Mant. I. 99* (1767).

**E. fasciculata** *Benth. in Linnaea XXII. 517* (1849).

**E. laurifolia** *Jacq. Obs. Bot. iii 1* (1768).

A shrub or tree, 1-6 m. high. *Stem* woody, sometimes robust, somewhat prickly; branches woody, leafy, armed with prickles, bright green, glabrous; the stronger branches continue perennially but the flowering shoots are annual. *Leaves* scattered along the branches, with the midribs of the leaflets sometimes armed with one or two recurved prickles beneath, armed and unarmed leaflets occurring on the same plant, glabrous; petiole slender, 8-12 cm. long, terete, with or without recurved prickles, glabrous; terminal leaflet 7-10 cm. long, 3-6 cm. broad, ovate or broadly or narrowly elliptic, obtuse to acute; petiolule of terminal leaflet 2.5-3.5 cm. long, sometimes with one or two prickles; lateral leaflets 6.5-9.5 cm. long, 2-5.5 cm. broad, ovate or broadly or narrowly elliptic, obtuse to acute. *Stipules* 0.8 cm. long, narrowly lanceolate, glabrous, deciduous. *Racemes* lateral, very laxly many-flowered, 11-30 cm. long, occurring on the upper portions of the foliage shoots. *Flowers* scarlet, showy, erect or horizontal, arising in clusters of two or three, appearing with the leaves, sometimes in the axil of a leaf. *Bracts* either wanting or early deciduous; bracteoles linear, glabrous, deciduous. *Pedicel* 2-2.5 cm. long, glabrous. *Calyx-tube* 1.2-1.5 cm. long, 1.2-1.5 cm. diameter above, broadly campanulate, distinctly 2-lipped or subtruncate, widening with age, frequently broader than long, glabrous. *Vexillum* 3-4.4 cm. long, 2.1-2.9 cm. broad across the middle, ovate, obovate, or elliptic, obtuse, sometimes emarginate, with a short basal claw, glabrous; keel 2.4-3.8 cm. long, 0.9 cm. broad across the middle, ovate, sometimes falcate, shortly or not at all narrowed at the base; wings 0.7-1.8 cm. long, 0.3-0.5 cm. broad, ovate or oblong-ovate, scarcely narrowed at the base, shorter than the keel. *Filaments* 2.9-4.7 cm. long, with the vexillary filament free to about the middle of the staminal-tube and the rest free for 0.3 cm. above; anthers 2.5 mm. long. *Ovary* 1.4-2 cm. long, on an extremely long gynophore; style 0.5-1 cm. long, linear, glabrous; stigma small, simple, terminal. *Pods* and seeds not seen.

**Natal :** Durban district, Durban Botanic Gardens, *Forbes* 876 (D. 36468).

**Swaziland :** Mbabane district, *Nicholson* (N.H. 23007, 23010).

**Transvaal :** Pretoria district, Pretoria, *Mogg in Government Herb.* 11612 (N.H. 26205) Pietersburg district, Pietersburg, *Stapleton* (N.H. 23008).

## SOUTH AFRICAN RUST FUNGI IV.

By

Ethel M. Doidge.

(Part III of this series appeared in *Bothalia*, Vol. III, Part IV, published April, 1939.)**Caeoma Lichtensteiniae** nov. sp.

Pycnidiis subepidermalibus, amphigenis v. petiolicolis, inter aecidiis sparsis, lenticularibus, melleis, 100–125  $\mu$  diameter. Aecidiis hypophyllis v. petiolicolis, singulis saepe epiphyllis, in epiphylo maculas fuscas generantibus, praecipue ad nervos evolutis, partibus matricis leniter tumefactis insidentibus et greges irregulares v. elongatos 2–15 mm. longos formantibus, dense confertis, 200–300  $\mu$  diameter., pallide aurantiacis, epidermide diu tectis, dein nudis epidermide rupta cinctis. Sporis variabilis, ovatis, oblongis, subglobosis v. angulatis, dense verrucosis, subhyalinis, 25–32  $\times$  15–22.5  $\mu$ , episporio 2.5–3  $\mu$  crasso.

Hab. in foliis petiolisque *Lichtensteiniae* sp., Salisbury, S. Rhodesia, leg. Eyles (1966) 14009.

**Puccinia Antirrhini** Diet. et Holw.

In Hedwigia 36 (1897) p. 298; Syd. Monogr. Ured. I (1904) p. 245.

Uredo-sori hypophyllous, brown, pulverulent; on the leaves circular to irregular in outline, scattered, in irregular groups, or in circles round primary sori, often becoming confluent, up to 1 mm. diameter; on stems more elongated and often coalescing to form long lines; surrounded by the torn epidermis. Uredospores globose to ellipsoid, yellow brown, briefly and rather closely echinulate, 22–30  $\times$  21–25  $\mu$ , episporio 1.5–2  $\mu$  thick, with 2–3 equatorial germ pores.



Fig. 1.—*Puccinia Antirrhini* Diet et Holw. Teliospores, showing 5 spores of the pale, slender form on the left, and three of the darker, broader form.

Teleutosori amphigenous, mostly hypophyllous, on pale or dry indefinite leaf spots, similar to the uredo-sori but darker, pulvinate. Teleutospores clavate or oblong-clavate, of two distinct types. Slender form oblong or oblong-clavate, pale fuscous, 50–70  $\times$

16–17.5  $\mu$ , apex usually more or less acute, rarely somewhat rounded or truncate, strongly thickened up to 12  $\mu$ , occasionally 3-celled and up to 75  $\mu$  long. Shorter and stouter form clavate, chestnut brown, 32–52.5  $\times$  17.5–22.5  $\mu$ ; apex rounded or truncate, rarely acute, thickened up to 8  $\mu$ . Both forms smooth, constricted at the septum, tapering at the base, rarely somewhat rounded at the base, epispore 1–2  $\mu$  thick, germ pore in the upper cell apical, obscure in the lower cell, pedicel subhyaline, up to 75  $\mu$  long, rarely up to 125  $\mu$  long, ca 7.5  $\mu$  thick. Both forms are to be found in the same sorus.

on leaves and stems of *Antirrhinum majus* L., Westville, Durban, McClean, 30869; Port Elizabeth, Lust, 30816; East London, Wilson Thompson, 30865; Kidd's Beach, East London, Venables, 30866; Kirkwood, Hess, 30867; Grahamstown, N. J. G. Smith, 30868.

The *Antirrhinum* rust was not recorded as occurring in South Africa until September, 1939, when it occurred in epiphytotic form in the coast districts of Natal and the eastern Cape. The outbreak was recorded by Miss A. M. Bottomley in the public press at the end of 1940.

#### ***Puccinia Junci-oxycarpi* n. nom.**

Syn. *Puccinia Junci* (Strauss) Wint. var. *africana* Doidge in Bothalia II (1927), p. 116, on *Juncus oxycarpus* E. Mey., Hennops River, Doidge, 2039.

European material of *Puccinia Junci* is now available for comparison. (Sydow. Uredineen 2169, 2469 on *Juncus Gerrardus*). The European rust, *Puccinia Junci*, according to Sydow (Monogr. Ured. I, p. 643) occurs only in the coastal region of the Baltic and the North Sea. It has larger sori than the South African rust on *Juncus Oxycarpus* and the teleutospores are different. The South African rust has very minute sori and shorter teleutospores with apex usually rounded and less thickened than in *P. Junci*; mesospores are abundant. It also differs widely from other species of *Puccinia* on *Juncus* spp. described from Europe and North Africa.

I consider that the South African rust on *Juncus oxycarpus* should be regarded as a distinct species.

#### ***Puccinia Kuhnii* (Krug.) Butl.**

Ann. Myc. 12 (1914), pp. 81–82, fig. 4; Syd., Monogr. Ured. 4 (1924), p. 608.

Syn. *Uromyces Kuhnii* W. Krug., Bericht der Versuchs-Station für Zuckerrohr in West Java, Kagok-Tegal Heft I, Dresden (1890), p. 120; N. A. Cobb, Agric. Gazette of N.S. Wales (1893), p. 799.

*Uredo Kuhnii* Wakker et Went., De Ziekten van het suikerriet op Java, Leiden (1898), p. 144.

Uredo-sori hypophyllous, very rarely epiphyllous, on indefinite, elongated, pale yellow to purplish red leaf spots, arranged in series, oblong to linear, 0.5 to 1 mm. long, often becoming confluent and forming longer lines, partially veiled by the epidermis which ruptures early and exposes the powdery spore masses. Paraphyses fairly numerous, peripheral, clavate or cylindrical, straight or curved, sub-hyaline to brown with a wall 1–2  $\mu$  thick. Uredospores very variable in form and size, mostly ovate to pyriform, less frequently sub-globose, pale yellow to light chestnut brown, 25–42  $\times$  17–25  $\mu$ ; epispore remotely echinulate, 1.5–2.5  $\mu$  thick, either of equal thickness throughout or thickened, at the apex up to 5  $\mu$ ; germ pores 4, equatorial.

Teleuto-sori hypophyllous, black, small, linear, or teleutospores developing in the uredo-sori. Teleutospores oblong to clavate, rounded or somewhat flattened at the apex, attenuate at the base, not constricted at the septum or very slightly so, pale yellow (mature 25–40  $\times$  10–18  $\mu$ ; pedicel short, hyaline. Paraphyses similar to those in the uredo-sori,

on leaves of *Saccharum spontaneum* L., Mount Edgecombe, Natal, McMartin, 30752.



This rust is not known as a disease of sugar cane in Natal, and has only recently been observed by Dr. McMartin on a variety of *Saccharum spontaneum* from Turkestan. Sydow (l.c.) points out that there are two forms of uredo-spores, which may occur in the same or in separate sori, one with episporium of even thickness, and one thickened at the apex. The uredo-spore with thickened apex was apparently taken by Kruger for the teleutospore of a *Uromyces*, and the rust described as *Uromyces Kuhnii* Krug. Wakker and Went pointed out that this was only a uredo-form, and the sugar cane rust was for many years known as *Uredo Kuhnii* Wakker et Went.

Teleutospores are rarely found, and are absent from the South African material. *Puccinia Kuhnii* is known in the uredo-stage in Java, India, Japan, Australia, Ceylon and the Philippines, occurring on *Saccharum officinarum* and several wild *Saccharum* spp.; but the teleuto-stage has only been recorded by Butler (l.c.) on *Saccharum spontaneum* collected in Burma.

Cobb illustrates 2-celled paraphyses, which have not been observed in the South African material; Butler thinks it possible, however, that the 2-celled body figured by Cobb was an immature teleuto-spore.

***Puccinia McCleanii* nov. sp.**

Soris teleutosporiferis amphigenis, sparsis v. aggregatis, rotundatis v. oblongis plerumque transversalibus, minutis, usque 0.5 mm. longis, saepe nervis foliis limitatis atro-brunneis, mox nudis, pulverulentis, epidermide fissa cinctis v. semi-velatis. Teleutosporis oblongo-clavatis v. oblongis, apice plerumque rotundatis, saepe truncatis v. conico-angustatis, saepe oblique attenuatis, medio leniter constrictis, basi attenuatis, dilute flavo-brunneis, levibus,  $35-62.5 \times 12.5-20 \mu$ , plerumque  $50-56 \times 14-16 \mu$ , episporio 1-1.5 crasso, apice leniter incrassato usque  $4 \mu$ ; pedicello persistenti brunneolo, usque  $45 \mu$  longo Paraphysibus nullis.

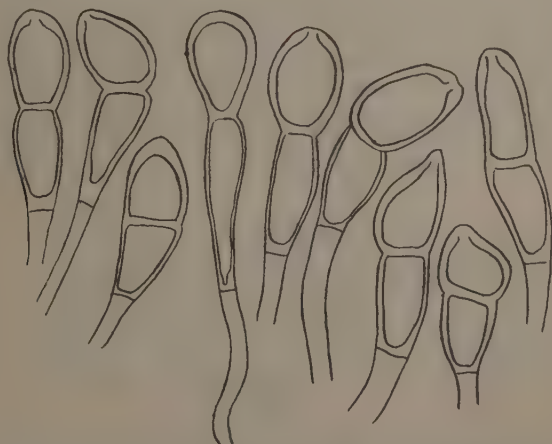


Fig. 2.—*Puccinia McCleanii* Doidge. Teleutospores.

Hab. in foliis *Gladioli Ludwigi* Poppe, Nottingham Road, leg. McClean, 30996.

This species differs in several respects from *P. Gladioli* Cast., which is recorded from the Mediterranean region. The teleutospore are more slender and lighter in colour, pale yellow brown; the lower cell paler, thinner-walled and concolorous with the pedicel. The apex is only slightly thickened, and is traversed by a conspicuous germ pore. There are no paraphyses. The teleutospores of *Puccinia Gladioli* are illustrated for comparison.



Fig. 3.—*Puccinia Gladioli* Cast. Teleutospores.

*Puccinia Gladioli* has not been recorded from South Africa, and there appears to be no record of its causing serious damage to cultivated varieties of *Gladiolus*. The "rust" which was first reported in commercial plantings of *Gladiolus* in Natal in 1929 and on several more recent occasions, mostly from the coast districts of Natal and the eastern Cape, is *Uromyces transversalis*. This species which is common on indigenous *gladiolus* spp., caused serious damage in commercial plantings of *Gladiolus* in the eastern Cape, Natal and the Transvaal during the seasons 1937–1938 and 1938–1939 when the rainfall was exceptionally heavy.

In Bothalia II (1927), p. 107, a species of *Puccinia* was described as *Puccinia Gladioli-crassifolii*. Unfortunately the host had been wrongly identified, and the material is too fragmentary for accurate diagnosis; the plant is definitely not a *Gladiolus* sp., but is probably a member of the family Iridaceae. It may be possible to collect this rust again and to identify the host correctly.

***Sphaerophragmium Artabotrydis* nov. sp.**

Soris teleutosporiferis hypophyllis, maculis orbicularibus brunneis v. astro-brunneis, usque 2 mm. diameter indeterminatis insidentibus, sparsis v. subgregariis, 0.5–1.5 mm., rarius usque 2 mm. diameter, rotundatis v. irregularibus, obscure brunneis v. atris, mox nudis en pulberulentis, epidermide fissa cinctis. Teleutosporis lateraliter applanatis ambitu suborbicularibus, ad septa constrictis, ex cellulis 4 (rarissime 3) compositis, brunneis, 30–35  $\mu$  v. usque 40  $\mu$  diameter, superficie appendiculis fuscis v. brunneolis ad apicem minute stellatim lobatis quasi glochidiatis, rarius simplicibus acutis leniter dilatatis v. uncinatis, 4–6  $\mu$  raro usque 10  $\mu$  longis laxe et irregulariter obsitis; cellulis singulis equalibus, episporio ca 1.5  $\mu$  crasso; pedicello hyalino, crasso persistenti, usque 90  $\mu$  longo, 7–10  $\mu$  crasso.

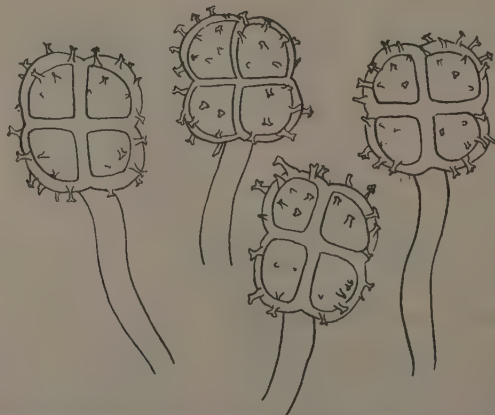


Fig. 4.—*Sphaerophragmium Artabotrydis* Doidge. Teleutospores.

Hab. in foliis *Artabotrydis Monteiroae* Oliv., Westville, Durban, leg. Howlett, 30761.

The teleutospores are very consistently 4-celled, the cross walls being at right angles to one another and the cells equal in size and similar in form. The surface view of the spore is a circle with flattened sides, the diameter along the cross walls measuring  $30-35\ \mu$  and diagonally between them about  $40\ \mu$ . The lateral view resembles the teleutospore of a *Puccinia*  $30-35\ \mu$  long and ca  $20\ \mu$  broad. There is apparently one germ pore at the apex of each cell.

This species differs widely from *Sphaerophragmium Chevalieri* Har. et Pat. (Buletto Myc. Fr. XXV (1909), p. 109) which occurs on Anonaceae in West Africa. The teleutospores of this species consist of 5-8 cells irregular in form and arrangement.

### **Uredo Scirpi-maritimi nov. sp.**

Soris amphigenis plerumque hypophyllis, maculis atrobrunneis insidentibus, sparsis v. laxe seriatim dispositis, usque 1 mm. longis, dilute brunneis, diu epidermide inflata tectis. Sporibus ellipsoideis v. ovatis, aureo-brunneis, dense minuteque verruculosis,  $27.5-37.5 \times 15-22.5\ \mu$ ; episporio  $2-2.5\ \mu$  crasso, poris germinationis 2-3 equatorialibus conspicuis praeditis.

Hab. in foliis *Scirpi maritimi* L., Uitenhage, leg. Zeyher (4422) 30904.

This rust was found on Zeyher's specimen in the phanerogamic herbarium; I am indebted to Dr. Dyer for pointing it out to me. It differs from *Uredo Scirpi-corymbosi* in the narrower, thicker-walled, verruculose uredospores. It approaches more nearly to the description of the Australian rust *Uredo Scirpi-nodosi* McAlp. I have not seen this species.

### **Uredo Cassiae-mimosoidis nov. sp.**

Soris amphigenis, sparsis v. gregariis, rotundatis v. ellipticis,  $0.5-0.75\ \text{mm.}$  longis saepe confluyendo irregularibus, ferrugineis, pustuliformibus, diu epidermide pallida tectis, dein ea fissa cinctis v. semi-velatis, pulverulentis. Sporibus ovatis, ellipsoideis, subglobosis v. irregularibus,  $21-27.5 \times 16-21\ \mu$ , densiuscule breviterque echinulatis, flavidis, episporio  $1.75-2.5\ \mu$  crasso, poris germinationis 2-4, plerumque 3, equatorialibus conspicuis praeditis.

Hab. in foliis *Cassiae mimosoidis* L., Donkerpoort, Pretoria dist., leg. Doidge et Bottomley 29741.

### **Uredo Psoraleae-polystictae nov. sp.**

Soris hypophyllis, sine maculis, sparsis v. laxe gregariis, rotundatis v. irregularibus minutis, ca  $0.25\ \text{mm.}$  diameter vel in nervos ellipticis usque  $0.5\ \text{mm.}$  longis, mox nudis, epidermide fissa cinctis, pulverulentis, ferrugineis. Sporibus subglobosis, ovatis v. late ellipsoideis, tenuiter echinulatis, aureo-brunneis,  $24-32.5 \times 20-22.5\ \mu$ ; episporio  $2-3\ \mu$  crasso, poris germinationis 3 distinctis equatorialibus vel fere equatorialibus praeditis.

Hab. in foliis *Psoraleae polystictae* Benth., Durban, leg. McClean, 300994.

### **Uromyces Dolicholi Arth.**

in Bull. Torrey Bot. Club 33 (1906), p. 27 and in Mycologia 7 (1915), p. 186.  
Syn. *Uredo Dolichi* Arth. Bull. Torrey Bot. Club 33 (1906), p. 513.

*Uredo pamparum* Speg. in Anal. Soc. Cientif. Argent. IX (1880), p. 173; Syd. Monogr. Ured. IV (1924), p. 585.

*Uredo-sori* amphigenous but mostly hypophyllous, scattered or crowded, minute, round to irregular,  $0.3-0.5\ \text{mm.}$  diameter; the epidermis ruptures at an early stage and exposes the cinnamon brown, pulverulent spore masses, which are surrounded by the torn fragments of the epidermis. Uredospores globose or subglobose, briefly echinulate, brown,  $18-24\ \mu$  diameter, epispore about  $1.5\ \mu$  thick, with 2-4, usually 3, equatorial germ pores.



[Teleuto-sori similar to the uredo-sori. Teleutospores oblong fusiform or clavulate, tapering to both ends, slightly thickened at the apex ( $3-6\ \mu$ ) smooth, pale yellow or very light brown,  $25-38 \times 8-15\ \mu$ ; epispore very thin, about  $1\ \mu$ ; pedicel delicate, hyaline or subhyaline, up to  $40\ \mu$  long.]

on leaves of *Cajanus Cajan* (L.) Druce (= *Cajanus indicus* Spreng.) Winkle Spruit, Pole Evans, 1594, 1919.

Only uredo-sori are to be found on the South African material and according to Arthur (loc. cit.) all the early West Indian collections on this host show uredinia only. The South African specimens agree well with material collected in Domenico. (Ciferri., *Mycoflora Domingensis exsiccata* n. 4). The description of the teleuto-sori is quoted from Sydow's *Monograph Ured.* II., p. 96. According to Arthur (*Mycologia* loc. cit.) it is probable that *Uredo Cajani* Syd. is also identical with the above species.

### ***Uromyces Drimiopsidis* nov. sp.**

Sub *Uromyces Erythronii* v. *Drimiopsidis* nom. nud. in Herb. Kew.

Soris uredosporiferis amphigenis plerumque hypophyllis, sparsis v. laxe gregariis interdum subcircinatis, minutis, rotundatis v. oblongis, usque 1 mm. longis, epidermid diu tectis, dein ea fissa cinctis v. semi-velatis, pulverulentis, pallide cinnamomeo-brunneis. Uredosporis subglobosis ovatis v. ellipsoideis, echinulatis,  $20-25 \times 15-19\ \mu$ ; episporio  $15-2\ \mu$  crasso. poris germinationis obscuris.

Soris teleutosporiferis conformis, obscure brunneis. Teleutosporis plerumque ellipsoideis, rarius ovatis v. subglobosis, pallide flavo-brunneis,  $27.5-42.5 \times 15-22\ \mu$ ; apice rotundatis, incrassatione papilliformi dilutiore usque  $8\ \mu$  alta et lata praeditis, lineis subrectis vel undulatis et subinde anastomosantibus obsitis; episporio  $1-1.5\ \mu$  crasso, pedicello hyalino brevi.



Fig. 5.—*Uromyces Drimiopsidis* Doidge. Teleutospores.

Hab. in foliis *Drimiopsis maculatae* Lindl., Botanical Gardens, Durban, leg. Medley Wood (688) 11125.

The label on the specimens in Kew Herbarium is apparently in Cooke's handwriting, but no author's name for *Uromyces Erythronii* var. *Drimiopsidis* is given, nor can I find any description of this variety.

The rust described above differs considerably from *Uromyces Erythronii* (DC) Pass. The latter has darker brown, broader and more frequently globose teleutospores with a very small, almost hyaline papilla about  $3\ \mu$  and more rarely up to  $4\ \mu$  long. The sculpturing of the episporium, which is ornamented with raised longitudinal ridges, is similar. An aecidial form is described for *U. Erythronii* but no uredo-stage.

*Uromyces Holubii* nov. sp.

sub *Uromyces liliacearum* Ung. in Herb. Kew.

Soris teleutosporiferis hypophyllis maculis fuscis ellipticis insidentibus, in greges ellipticos 9–16 mm. longis et 3–6 mm. latos circinatim dispositis, mediocribus, mox confluentibus, epidermide diu tectis dein ea fissa cinctis v. semivelatis, pulvinatis v. sub-pulverulentis, brunneis. Teleutosporis castaneo-brunneis, quoad formam variabilis, globosis, late ellipsoideis v. ovatis, saepe irregularibus, apice rotundatis non incrassatis, basi rotundatis, levibus,  $42\text{--}52.5 \times 32.5\text{--}40\ \mu$  vel ca.  $45\ \mu$  diameter, episporio crasso,  $7.5\text{--}10\ \mu$  pedicello hyalino apice brunneo, persistenti, usque  $25\ \mu$  longo,  $5\text{--}7.5\ \mu$  lato.

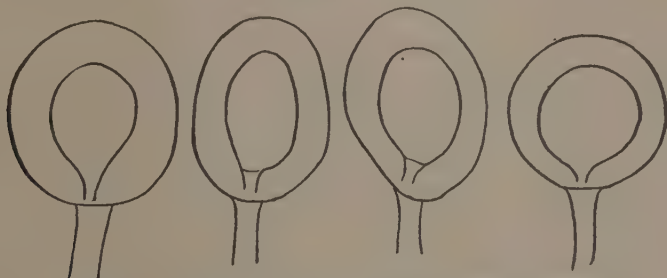


Fig. 6.—*Uromyces Holubii* Doidge. Teleutospores.

Hab. in foliis Liliaceae indet (*Dracaenae* sp.) Lishumo Valley, Zambesi, leg. Holub ex herb M. C. Cooke.

This rust somewhat resembles *Uromyces prupureus* Lagh., described on an undetermined Liliaceous plant from Angola, but differs in having larger spores and thicker episporium. It differs in many respects from *Uromyces liliacearum* Ung.

The type specimen is in Kew herbarium; a small fragment of the type is filed at Pretoria. (Cryptogamic herb. no. 30887).

*Uromyces Setariae-italicae* (Diet.) Yoshino

in Bot. Mag. Tokyo 20 (1906), p. 247; Syd. Monogr. Ured. II (1910) 339–340, Pl. XIII, fig. 171.

Uredo-sori amphigenous but mostly hypophyllous, scattered or seriate in longitudinal rows, minute, oblong, up to 0.5 mm. long, surrounded by the torn epidermis, pulverulent, cinnamon brown. Uredospores globose, sub-globose or ovate, finely and rather sparsely echinulate, yellow-brown,  $22\text{--}34 \times 18\text{--}26\ \mu$ ; episporium about  $1.5\ \mu$  thick and with 3–4 equatorial germ pores.

[Teleuto-sori mostly hypophyllous, scattered or in groups, minute, round or oblong, long covered by the epidermis, inconspicuous, greyish black. Teleutospores globose, ovate or oblong, often angular, rounded or truncate at the apex, not thickened or only very slightly so, smooth, yellow or yellow-brown,  $20\text{--}30 \times 16\text{--}24\ \mu$ ; episporium  $2\text{--}3\ \mu$  thick; pedicel hyaline or subhyaline, about equal to the spore in length.]

on leaves of *Setaria pallidifusca* Stapf et Hubb., Tweedie, Mogg, 11648 ; Nottingham Road McClean, 31003.

on *Setaria verticillata* Beauv., Groenkloof, Pretoria, Pole Evans, 9050 ; Muden, Doidge, 23212.

This species has been recorded on *Setaria glauca*, *S. intermedia*, *S. italica* with its variety *germanica*, *S. verticillata* and *S. viridis* from Japan and East India. The uredo-stage of the South African collections agrees exactly with the specimens from Poona (Sydow, Uredineen 2148-2149) on *S. italica* and from the Philippines (Fungi Malayana Baker No. 296). The latter specimen is labelled *Uromyces Setariae-italicae* (Diet.) Yoshino but no teleutospores can be found on the material. According to Sydow (loc. cit.) this fungus is usually found in the uredoform and the teleuto-stage is comparatively rare. Only the uredo has been found in South Africa ; the description of the teleutostage is quoted from Sydow's Monograph.



## A FUNGUS OF THE FAMILY ENTOMOPHTHORACEAE FOUND ON SUGAR ANTS (*CAMPANOTUS* SP.).

By E. E. Schaefer.

### INTRODUCTION.

During the early months of 1939 when prolonged and soaking rains fell in Pretoria, Transvaal, several "Sugar Ants"—*Campanotus* sp.—were seen at the Division of Botany and Plant Pathology running around with short and white furry growths on their abdomens. Closer examination showed that the growths were of a fungoid nature, and that they apparently protruded from the soft membranes between the abdominal segments. Their nature and position gave the abdomens the distinct ringed or banded appearance characteristic of insects attacked by species of the *Entomophthoraceae*. Search under stones and logs later revealed a fairly large number of the same species of ants, both living and dead, with their entire abdomens covered with much more conspicuous white fungous growths, which fastened them to the ground and stones, etc. These growths varied from loose, cottony masses of long white strands on some insects (Plate I) to compact and more or less solid creamy masses on others (Plate II). This variation was obviously dependent not only on the age of the growths, but also to a large extent on the dampness of the spots in which the insects were found. Although the growths varied in size, in no case were they ever seen extending beyond the abdomen or growing on any other parts of the insect's body. When the covering stones and logs were removed, many of the live ants on taking fright, were able to extricate their abdomens from the enclosing loose cottony growths, which were then left behind as hollow masses. In the structure of these a suggestion at least, of the bands or rings could still be seen. This characteristic appearance was also present and usually more obvious, in the denser growths from which the abdomens of the dead ants had been extracted. The insects which were able to free themselves were, except for a slight sluggishness, apparently normal in all respects.

When examined under a microscope the growths were seen to consist of masses of large-globose fungous spores, and what appeared to be long collapsed and unbranched mycelial threads. (Plate III, Fig 1.) The denser creamy masses consisted almost entirely of large spores, whereas in the loose cottony masses there was a fair amount of the apparently collapsed hyphae. The spores were globose, more or less uniform in size, and averaged about  $30\ \mu$  in diameter. Those from the loose growths had smooth or echinate walls enclosing coarsely granular contents, while those from the denser masses appeared to be more or less similar to resting spores found in the *Entomophthoraceae* in general (Plate III, Fig. 2). Their outer walls, however, had apparently shrunken giving them a wavy outline. Under the microscope the dissected abdomens of the ants were seen to contain a number of pieces of thick coarsely granular and intertwined hyphae (hyphal bodies). These hyphae differed in length, but were more or less uniform in diameter, although a few of the shortest pieces were somewhat thicker and more irregular than the rest.

## THE FUNGUS IN CULTURE.

The fungus grew readily on most of the common artificial media used in the laboratory. It grew and sporulated especially well on potato agar to which five per cent. dextrose had been added, and it was therefore from cultures on this medium that most of the following observations were made.

The cultures increased rapidly in size and soon covered the surface of the medium in a 9 cms. petri dish. The rapid increase was due primarily to the fact that the ripe spores were discharged in all directions several centimetres from the sporophores and that they germinated almost immediately. In the beginning the growing colony was circular, and appeared as a small, sodden, translucent, and colourless disc, in which the growing hyphae could be seen radiating from the point of inoculation. As the disc increased in size the central portion partially lost its sodden appearance, and the radiating hyphae were more distinct and appeared to be more numerous towards the circumference of the colony. After about 15 to 20 hours in an incubator at 28°C., sporophores formed in the centre of the colony and their attached spores appeared as a white powder in a small circular patch, which gradually increased in size and density (Plate III, Fig. 3). The spores were very soon discharged from the sporophores and could be seen scattered around the central white patch inside as well as outside the colony. The spores germinated almost immediately and soon gave rise to small daughter colonies (Plate III, Fig. 4). As growth continued, the distinct circular outline of the mother colony, which was about 2.5 centimetres in diameter, was gradually obliterated by the numerous discharged spores and their resultant colonies. As in the mother colony, formation and discharge of spores took place in the smaller colonies, and after about four days all suggestion of individual colonies was lost, and the entire surface of the medium was covered by an even white powdery layer of spores. The spores that were shot against the lid and sides of the petri dish adhered to the glass, which consequently became covered with a fine powder, in which, after germination had taken place, numerous fine hyphal threads could be seen with the naked eye.

At room temperature ( $\pm 23^{\circ}\text{C}.$ ) the spores germinated within an hour or two after they had been placed on the medium: the time taken apparently depended, to some extent at least, on the age of the spores. The number of germ-tubes arising from each spore was usually two or three, although one and four were also fairly common (Plate V, Fig. 1). They arose as blunt and hyaline outpushings from the spore-wall and grew very rapidly. (In some cases they had grown eight to ten times the diameter of the spore two and a half hours after inoculation). The hyphae were thick and more or less uniform in diameter ( $\pm 11.5\mu$ ); their contents were coarsely granular except for small portions of the tips, which remained hyaline throughout their growing period. In the beginning the contents of each spore gradually flowed into its growing germ-tubes until eventually the spore was completely emptied. (Plate V, Fig. 2). The protoplasm continued to flow along the growing hyphae towards the tips and so left the proximal portion of each hypha also empty. A septum then formed immediately behind the advancing protoplasm, thus cutting it off from the emptied portion of the hypha and the emptied spore. The distance at which the first septum was formed varied in the different hyphae. In some it was practically in line with the spore-wall, whereas in others it was some distance away. The protoplasm continued flowing with the growing tip and it was again cut off from the emptied portion of the hyphae by another septum. This process was repeated until eventually each hypha consisted of a series of empty segments with only the distal or growing end containing protoplasm. That actual growth took place could readily be seen by the increase in size of the protoplasm-filled segment. A septum did not arise only behind the protoplasm in the growing hyphal tip; at times several were formed in the hypha that was still completely filled with protoplasm. The protoplasm-filled segments thus formed gradually rounded off at the ends and so became individual short pieces of hyphae, which were capable of independent growth (Plate VII, Fig. 22). Instead of several septa arising in the protoplasm-filled hypha, there were times when only one was formed, in which case a certain amount of protoplasm was cut off from that in the tip, which continued growing in the

normal manner. In this way a segment containing protoplasm was isolated from the growing tip by an ever-increasing number of empty segments. The formation of these isolated and filled segments was commonly repeated a number of times, thus forming a hypha consisting of several protoplasm-filled segments separated by intervening empty segments. The protoplasm did not always flow from the germinating spores and along the hypha as a more or less compact mass. Large irregular spaces were often seen in the contents, giving the hypha the appearance of being only partly filled, and suggesting that all the flowing protoplasm could not keep pace with the growing tip. On the formation of a septum in this partly filled hypha, a segment containing the scattered protoplasm was also isolated from the growing tip by an increasing number of empty segments. The protoplasm in the isolated segment however, usually continued flowing in the direction of the growing tip, and consequently became more compact and accumulated behind the septum. During its flow towards the septum the accumulating protoplasm was successively cut off by septa from the portions of the segment that had become emptied, thus leaving an isolated and protoplasm-filled segment with several very short empty segments immediately behind it (Plate VII, Fig. 20). This process was commonly repeated or more than one septum formed at the same time in the hypha containing the scattered protoplasm, thus eventually giving rise to a hypha consisting of several protoplasm-filled segments separated from one another by a number of very short empty segments. The walls of the emptied spores and the emptied hyphal segments, after remaining in position for some time, usually collapsed gradually and in most cases eventually disappeared altogether.

When the isolated protoplasm-filled hyphal segments were left in the original medium, which had become stale, they did not show any further growth, and remained more or less dormant, but gradually accumulated and assumed various enlarged shapes and often became almost completely round (Plate VI, Fig. 7). After the culture had been growing for several days, i.e. when the surface of the medium had become covered by the large globose spores, the submerged mycelium consisted entirely of these variously shaped pieces of hyphae many of which were still connected by the empty segments. (Although the mycelium grew apparently only below the surface of the medium, a fair amount of collapsed hyphae and a few isolated filled segments could always be seen among the numerous large spores on the surface).

The sporophores, which developed as soon as the mycelium was well established, were more or less similar to the ordinary hyphae, but differed mainly in their aerial habit and their positive photographic reaction (Plate IV, Fig. 2). (Because of this reaction the spores were discharged towards the light and consequently the rate of increase in size of a young culture in the laboratory was not the same in all directions). The tips of the sporophores, unlike those of the growing hyphae, were very blunt and were not hyaline but granular. Although they were usually very short—about two to three times the diameter of the spore—many were seen whose length was eight to ten times the spore diameter.

The protoplasm in the sporophore continued flowing towards the tip, which gradually swelled. After more or less all the protoplasm had entered the swelling tip, the latter was cut off by a septum as a large globose mass—the mother cell in which the large single spore was developed. (The walls of the containing cell and of the spore were in close apposition, but could clearly be seen under high magnification, especially after the spore had been emptied of its contents). The sporophore remained turgid usually with a slight swelling on one side suggesting pressure within, and its tip penetrated a short distance into the spore as a dome-shaped columella. The contents of the spore moved or churned continuously as the protoplasm was entering from the sporophore. This churning movement increased until eventually the protoplasm was in violent commotion. The columella appeared to become slightly flattened suggesting that the pressure within the spore was increasing. It was at this stage that the spore was suddenly discharged from the sporophore as a large spherical body with a prominent hyaline papilla. The maximum distance that the spores



were discharged towards the light was about 35 millimetres. The sporophore remained turgid for a short time after the spore had been discharged, its columella appearing as a slightly swollen tip with or without a minute apiculus at the top. Within a few minutes however, it began to collapse gradually and after about a quarter of an hour appeared as a shrunken and flaccid tube at the end of which the columella was very obvious (Plate V, Fig. 6). After the discharge, traces of a broken membrane could usually be seen around the base of both the columella and the spore papilla. These fragments were obviously derived from the continuous membrane of the sporophore and the mother-cell. Owing to increased pressure in the spore and possibly also in the sporophore, this membrane was eventually ruptured, thus discharging the spore. The force was not always sufficient to free the spore from the sporophore notwithstanding the fact that the surrounding membrane had been ruptured. In this case the spore remained attached by its papilla to the columella as illustrated (Plate V, Fig. 6). At times the surrounding membrane was not ruptured at all in which case the spore remained attached to the shrinking and afterwards flaccid sporophore.

Under favourable conditions the discharged spore germinated almost immediately and a new mycelium was formed. Under conditions which were apparently not so favourable, the spore gave rise directly to a sporophore at the tip of which a secondary spore developed (Plate V, Fig. 4). The latter was commonly discharged in the usual way or else it sometimes gave rise to a tertiary spore, which in its turn was also discharged in the usual way. (Plate V, Fig. 5). At times two secondary spores developed from the same primary spore, and in exceptional cases as many as 16 very small secondary spores were seen still attached to the same primary spore (Plate VI, Fig. 16). In the beginning all the spores were more or less the same size—about  $35\ \mu$  in diameter—and all possessed the large papilla. In the older cultures, however, the spores varied from  $13\ \mu$  to  $56\ \mu$  in diameter and most had lost the papilla. The smaller of these spores were seen developing only as secondary spores and never directly from the mycelium. Besides the big variations in size of the spores in the older cultures, many differed from the rest in having numerous, soft hair-like outgrowths covering the entire surface of the spore (Plate VI, Fig. 17). These spores when placed on fresh medium gave rise to one or more germ-tubes in the usual way. (Plate VI, Fig. 18).

In addition to the above, small almond-shaped spores were occasionally found in the older cultures (Plate VI, Fig. 11). These measured approximately  $10\ \mu \times 18\ \mu$  and were never seen arising directly from the mycelium. They were in all cases seen to develop from the very small globose spores (Plate VI, Fig. 12), thus it appears evident that they were born only as tertiary spores. On germination they gave rise to germ-tubes somewhat thinner than the normal. (Plate VII, Figs. 13 and 14).

#### PATHOGENICITY OF THE FUNGUS.

The attempts to infect the same species of ants from which the original cultures were obtained, were unsuccessful, and in no case did any of the live or dead insects develop the typical growths when placed in a petri dish containing the fungus cultures. The larvae of these ants, however, all died within two days after having been placed on the cultures. They were then seen to be full of short pieces of hyphae of various shapes and sizes (hyphal bodies). (Plate VI, Fig. 8). These hyphal bodies were placed on fresh medium, gave rise to normal mycelium (Plate VI, Fig. 9). Within a few hours after death the fungus grew from the larvae and sporulated on the outside. (Plate IV, Fig. 1). Those that were placed on the medium alone, or on cultures together with the adult insects did not die within the same period.

The fungus also attacked termites. In all 198 of these insects were placed on cultures in nine petri dishes and within two days all were dead. Of the 72 placed on the medium alone only eight died during the same time. Those had been attacked by the fungus were full of hyphal bodies (Plate IV, Fig. 3), and were soon covered by the sporulating fungus.

## IDENTITY OF THE FUNGUS.

A fungus practically identical with the above was described by Martin,\* who found it in 1923 as a contamination on a plate of nutrient agar inoculated from a piece of very rotten wood. The fungus which was obviously one of the *Entomophthoraceae*, was shown to be a species of *Conidiobolus*, and because of the villose appendages of some of the older spores, was named *Conidiobolus villosus* n. sp. The fungus here described however, possesses certain characteristics which make its identity with *C. villosus* somewhat doubtful. Among these are its parasitism, and the stage in its life-history where several minute secondary spores arise from a single spore.

In 1933 a fungus very similar to *C. villosus* was isolated by Kevorkian† from living termites, of the genus *Nasutitermes*, which had been placed in damp chambers for observation. On obtaining sub-cultures of Martin's *C. villosus*, Kevorkian found that it was identical with the one isolated from termites: he demonstrated that it could adapt itself to a parasitic habit, especially on termites, and also observed the additional stage consisting of the production of several minute secondary spores arising from a single spore. After further studies Kevorkian felt justified in making the new combination *Entomophthora coronata* (Cost.); in this species he included Martin's *C. villosus*, the fungus which he himself had isolated from termites, an undetermined species of *Conidiobolus* isolated by Derx from an unknown source, and *Delacroixia coronata* (Cost.) Sacc. and Syd.

Notwithstanding the fact that the writer has observed certain additional minor characteristics such as the presence of spores without basal papillae and the small almond-shaped spores, the fungus described in this article must obviously be regarded as a strain of the same species, *Entomophthora coronata* (Cost.) Kev.

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\* Martin, G. W.—Morphology of *Conidiobolus villosus*. Bot. Gaz. 83: 311-318, pl. 16, 3 fig. 1925.

† Kevorkian, Arthur G.—Studies in the Entomophthoraceae I. Observations on the genus *Conidiobolus*. Journ. Agric. Univ. Puerto Rico. Vol. XXI, No. 2, 191-200, 3 pl. 1937.







PLATE I.

A sugar ant—*Camponotus* sp. —with its abdomen covered with, and attached to the ground by the loose cottony fungous growth. N.B.— The head is blurred on the photograph owing to movement as the ant was still alive.



PLATE II.

A collection of sugar ants showing various stages of the fungous growths.

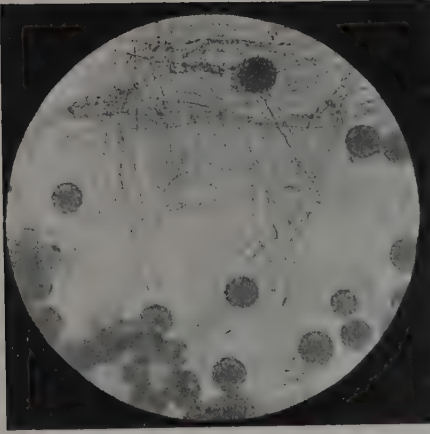


Fig. 1.

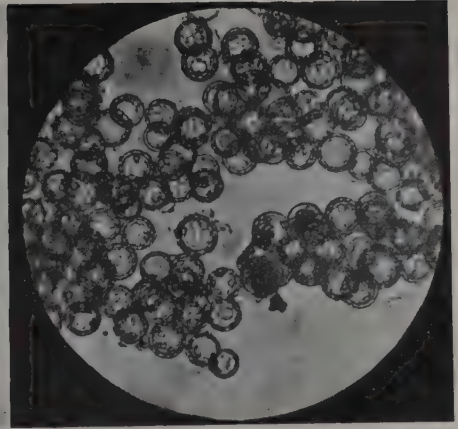


Fig. 2.

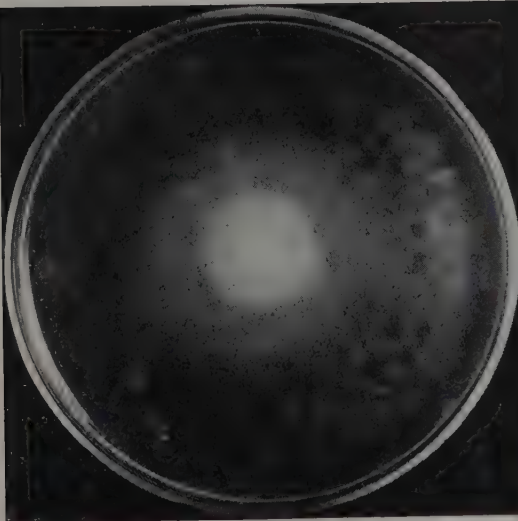


Fig. 3.

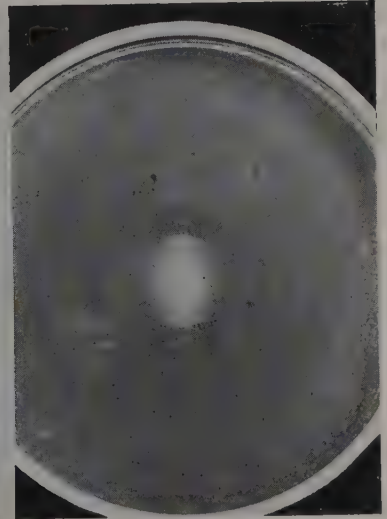


Fig. 4.

## PLATE III.

Fig. 1.—The loose cottony growth as seen under the microscope.

Fig. 2.—The compact growth as seen under the microscope.

Figs. 3 and 4.—Development of the fungous colony on potato  $\pm$  5 per cent. dextrose agar.



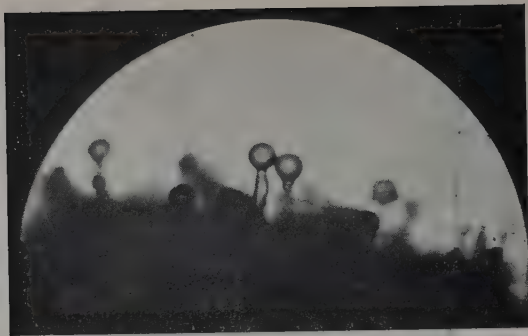


Fig. 1.

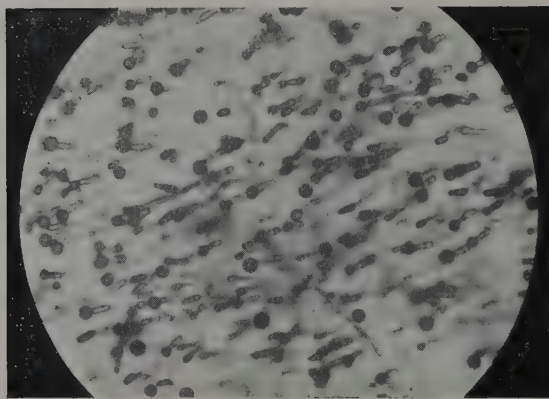


Fig. 2.

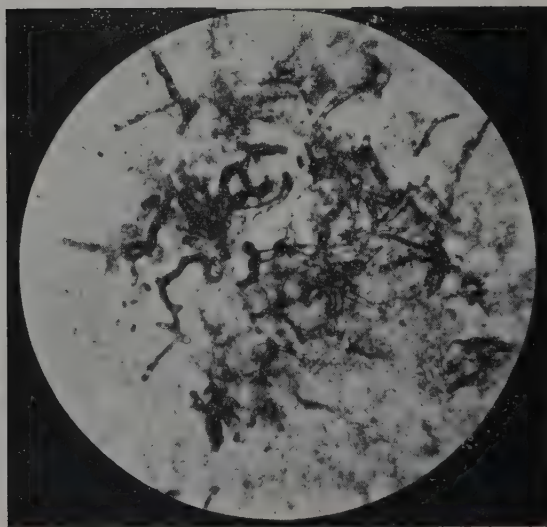


Fig. 3.

PLATE IV.

- Fig. 1.—The fungus sporulating on sugar ant larva.  
 Fig. 2.—Sporulating culture as seen under the microscope.  
 Fig. 3.—Hyphal bodies from termites.

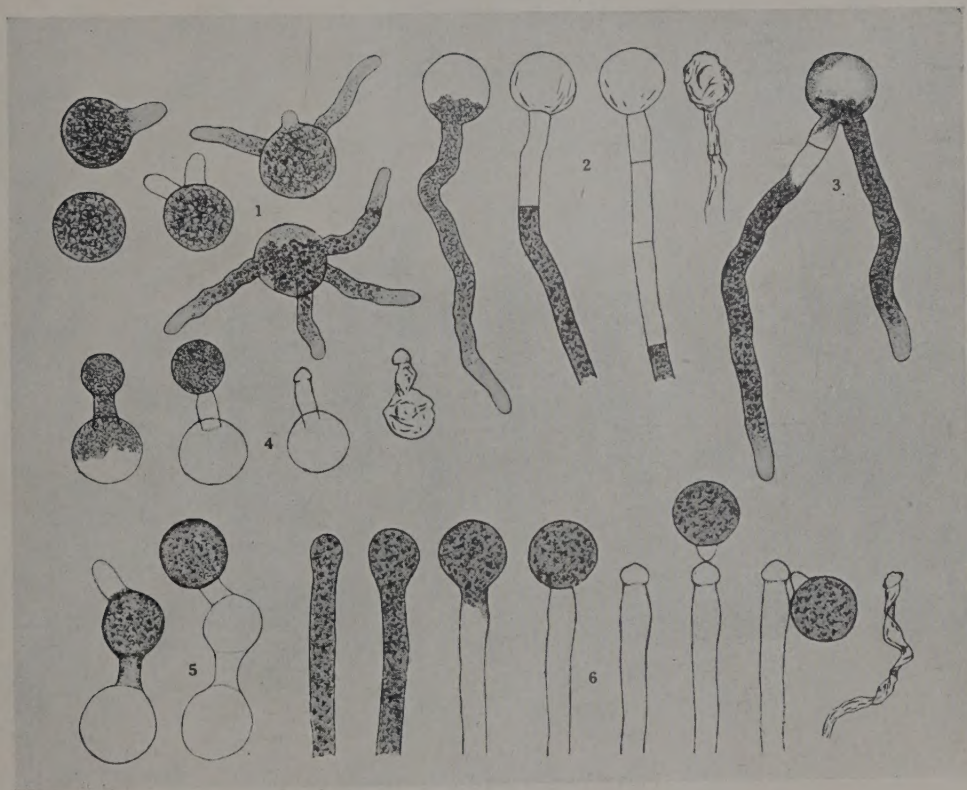


PLATE V (Camera lucida drawings).

Fig. 1.—Spores with 0–4 germ-tubes.

Fig. 2.—Protoplasm flowing out of spore and along germ-tube, emptied spore and hypha collapsed.

Fig. 3.—Spore protoplasm cut off by septum from longer germ-tube and now flowing into new germ-tube.

Fig. 4.—Formation and discharge of secondary spore.

Fig. 5.—Formation of tertiary spore.

Fig. 6.—Formation and discharge of spore: collapsed sporophore.



PLATE VI (Camera lucida drawings).

- Fig. 7.—Hyphal bodies from culture  $\pm$  10 days old.  
 Fig. 8.—Hyphal bodies from ant larva.  
 Fig. 9.—Germinating hyphal bodies from ant larva.  
 Fig. 10.—Isolated segments of hyphae germinating on fresh medium.  
 Fig. 11.—Almond-shaped spores.  
 Fig. 12.—Development of almond-shaped spores.  
 Figs. 13 and 14.—Germinating almond-shaped spores.  
 Fig. 15.—Spores showing relative shapes and sizes.  
 Fig. 16.—Numerous small secondary spores borne on single primary spore.  
 Fig. 17.—Spores with soft hair-like outgrowths.  
 Fig. 18.—Germination of spores with soft hair-like outgrowths.



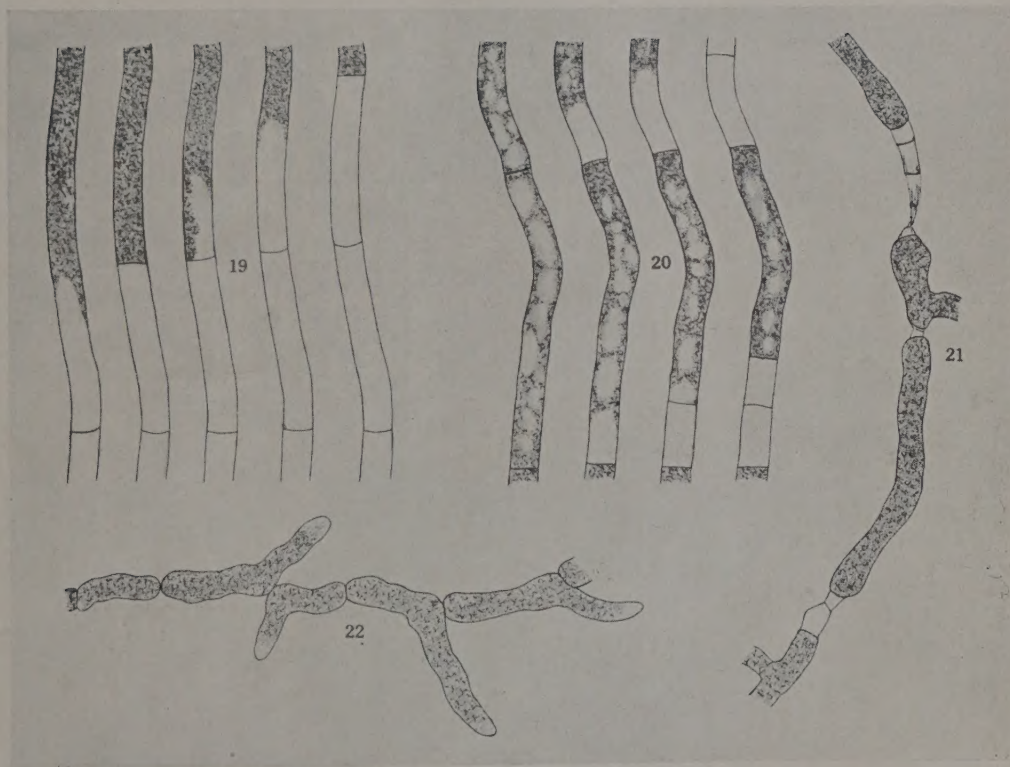


PLATE VII.

Fig. 19.—A hypha with flowing protoplasm successively cut off by septa.

Fig. 20.—Segment formation in partly filled hypha.

Fig. 21.—Isolated hyphal segments commonly found in culture.

Fig. 22.—Protoplasm-filled segments without intervening empty segments.

